MAY 15 1918

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CXLII. No. 2865.] LONDON, APRIL 9, 1918. [70TH YEAR. PRICE 6d.

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLII., No. 2865.] TUESDAY, APRIL 9, 1918. [70TH YEAR.

EDITORIAL NOTES.

The Wages Award.

THE award has been issued of Sir G. S. Gibb and his colleagues of the Committee on Production, to whom had been referred for adjudication the demands made by the Federation of General Workers on behalf of the gas industry's workmen. The award does not give all the Federation asked for; but what it does bestow we regard as of very grave importance to the industry in the circumstances of the already extraordinarily heavy war burdens, which in diversity and character are unequalled by those of any other industry. The award—combined with the new gas-rationing regulations south of the diagonal line drawn from the Bristol Channel to the Wash, and the other gas restrictions generally in the country—will make a considerable difference to the case that will have to be put forward by the sliding-scale companies in Parliament and to the question of the amount of increases of the standard and maximum prices that have in certain cases been specifically asked for. One cannot tell exactly what are the elements in the cases for and against the new wages demands that have persuaded the Committee to arrive at the decision which is now before us. While all that was asked for on behalf of the men has not been conceded, the decision indicates plainly that determination of the matter has not taken into account the position of the industry itself through war conditions, and its capacity to bear this extra burden. To all intents and purposes, the award (by the additions made) sets aside as inadequate all prior awards, and all prior generosity on the part of the administrators of gas supply undertakings. It is an uncomfortable state of things, which is intensified by the recognition by the Ministry of Labour of a Federation of Unions, instead of a Union directly representing gas workers only. We view with anything but satisfaction such recognition; and more particularly as there has not been any universal mandate to the Federation from gas workers to make an appeal for a general increase of their war allowances.

The Federation, it will be remembered, asked for an addition for all adults of 10s. to the war wages advances, whatever the amount, with a minimum of £1 1s., the increase to be retrospective to Jan. 1. Under the conditions set out in the award [*see* p. 49], £1 per week is defined as the maximum war wage addition. All employees over eighteen years of age who are receiving 16s. or upwards in war advances are to have them made up to £1; while those men who are receiving less than 16s. war advances are to have a uniform 4s. addition. This only applies to a six-day week or six shifts. Boys and youths under eighteen years of age (5s. per week addition was sought) are to have an advance of 2s. per week, with a maximum of 10s. The Committee declined to interfere in the case of women, as they come under the Statutory Rules and Orders made by the Minister of Munitions, under section 6 of the Munitions of War Amendment Act, 1916. The Federation also asked for the general addition of the iniquitous 12½ p.ct. This has been allowed in the case of workers of 21 years of age and over who are paid at plain-time rates. The words of the award are: "Shall receive a bonus of 12½ p.ct. on their earnings, which shall not alter or become part of their time rates." This means that the men who—under the award, and not for any other reason—are entitled to the 12½ p.ct. will receive, according to their war advances, 4s. or less per week, *plus* 2s. 6d. on every pound earned. The 12½ p.ct. will also cancel bonuses and allowances under Order No. 1301 if the bonuses and allowances are less than the 12½ p.ct., which will then be substituted. Other classes of workers who come within the description in the award, will get 7½ p.ct. All this will make a very serious addition to the wages bills of gas undertakings. But it does not end there. The addition of 4s. or less as the case may be, and the prior war advances are to be regarded as war wages, and taken into account in calculating the payment for overtime, night duty, or work on Sundays or holidays; and this again will help to swell the wages charge. To the reduction to 4s. of the 10s. demanded, to the conversion of the £1 1s. minimum to £1 maximum, and to the refusal of the Committee to make the 12½ p.ct. universal, one other crumb of comfort may be added; and it is that the Committee have not conceded the request that the award should be retrospective to the beginning of the year, but it has effect from the first full pay day after March 21.

It is not supposed for one moment that the Federation anticipated they would get all for which they asked. It is generally the way in these matters to include a good margin which will allow some elasticity. What has been awarded, however, will make a material increase of charge on the gas consumers—the working man prepayment consumer, as well as the ordinary consumer. It must come from them; there is no other source. And Parliament will have to make considerable concessions to the industry, unless they desire to see the industry's capital shattered, depreciated, and unrewarded. Gas undertakings cannot without substantial relief continue under the ever-growing burdens. Last year the total amount of wages paid by the Gas Light and Coke Company amounted to no less than £1,524,536, compared with £1,261,012 in 1916. The South Metropolitan Gas Company paid in wages in the year 1917 £885,392; and in 1916 £660,181. The further we go back in the war years, of course, the greater the difference. "The only satisfaction," said one gas man, on hearing the terms of the award, "is "that we now know where we are;" and "the award "should give the industry immunity from labour wage "questions for some time to come." As to the latter, we say nothing; as to the former, no gas undertaking concerned in the award will know exactly where it is until its responsible officials have settled down and counted up the cost of the fresh burden. One matter is vague. Does the award apply to all undertakings, or only to certified undertakings, and those that have consented to abide by the award? The application indicated universality; and the award does not define any limits or exemptions. In our mind, there is not the slightest doubt as to what will happen in the matter. But this is for each undertaking to settle for itself; and then (where it is thought that the award does not apply) await developments.

Grading and Washing of Coal—A Reconstruction Programme Wanted.

IT is advisable to take advantage of opportunity when the purpose is good. But it is a trait of human nature to defer things to what is loosely called a more convenient season, without considering the possibility that—the conditions of the future being unknown, and more or less the sport of Dame Fortune—the most convenient season may really be the present. Besides it is good policy to take things betimes rather than too late; and equally it is good policy to look forward. Some of the remarks made by Mr. Thomas Glover, at the recent meeting of the Southern Association, appear to us as of present high importance, in view of their effect upon the future. There were advice and prudence in them; but up to now they seem to have fallen on deaf ears,

or, perhaps, what was said has been pushed aside with the thoughts that "sufficient for the day is the evil thereof in "relation to coal," and "things will right themselves after "the war." But the matter which we have now in mind as worthily claiming particular attention is, as we understand Mr. Glover, not merely one over which we should be satisfied with things righting themselves, but one in regard to which we should look and work for an improvement, and more so as (generally speaking, progressively) coal quality, as the coal is wrought, is not something that—independent of prevailing troubles—is passing from a lower to a higher level, but just the reverse. This is inevitable. As the best seams of coal become exhausted, thinner and poorer ones succeed; and, in winning coal from the thinner seams, it is unavoidable that greater impurity should be found in it, unless it undergoes adequate and proper treatment before leaving the pithead. Recognizing this, it would be a good thing to take "Time by the Forelock," and thus translate recognition into action, and prepare for the coal position to which we are surely drifting.

The gas industry (and not it alone) is in the midst of a great coal problem, of a quantitative as well as a qualitative character, to say nothing of its financial bearings upon current fortunes. The various phases of this problem alone may well be considered sufficient for the present. But the country is prominently participating in a great world war; and at the same time it is considering problems associated with reconstruction after the war. This is prudent; and it would likewise be prudent on the part of the gas industry to devote some of its attention to the coal problem as it affects the future, and as one of the elements in its reconstruction. In the midst of a general reconstruction, the industry cannot expect that its old ways will do. It has to conform to new requirements—and to competition as well. The cheapest combustible gas that can be supplied—the gas that, used in atmospheric burners, will give the best results for the money expended—is the gas that will be needed. The industry cannot afford, looking to the trend of events, to pay heed to luminous flames; it must look beyond them. But the gas that it must supply is the best possible, having regard to use and value for money, and the highest return realizable from secondary products. If the material from which the gas is made, and from which the secondary products are recovered, is of inferior quality, the maximum result cannot be expected. And this was what Mr. Glover was aiming at when he, from the inner knowledge that he has acquired of many things relating to coal, advised that the gas industry should at once look into the question of the grading and the washing of coal, and put forward united endeavours to secure clean and suitable coal—coal as free as possible from dust, useless material, and impurities. Sometimes our best lessons are obtained from extremes, especially when the extremes come sharply upon conditions that, although probably not good, were the best then attainable. We have had these extremes lately in connection with inert material and impurities in coal. We have heard much of the uneconomy of this—uneconomy stretching from the pit head, through transport to handling at the destination, and then upon plant and productive efficiency, which latter includes both quantity and quality. We have heard, too, of a greater frequency of spontaneous combustion of stocked coal through its dusty and sulphury character. The extremes have had their emphasis. Their moral is to get as far back from them as possible; for the further back that one gets, naturally the greater the economy from pithead to carbonizing plant and productive efficiency.

Hence Mr. Glover's advice that, in the interests of a good production of gas (whatever its calorific value per cubic foot), in the interests of coke of low ash content, and in the interests of the largest yield of the best quality of other secondary products, the gas industry should take into consideration now, and work for, the best preparation of coal for its composite purposes, that can be realized by grading and washing, as part of its scheme of post-war reconstruction. Serviceable coal, with as little in it of all that is unserviceable and deteriorating to result is what is required for maximum economy and efficiency, under the circumstances of suitable plant and proper working supervision. In this connection, what Mr. Glover had to say at the Southern meeting upon the economizing and the efficiency effects of properly graded coal for continuous vertical retorts is worth bearing in mind. And so are his remarks as to co-operative washeries at collieries. The gas industry, however, cannot make any move in this matter of grading and washing until they get colliery proprietors thoroughly interested. There would be a means of getting them interested by specifying graded and washed coal. But at present it is a matter of *post*-war reconstruction; and when the technical men of the gas industry have conferred among themselves on the question, they might then invite colliery managers to a conference regarding the subject. Other industries are actively considering after-the-war reconstruction; and so must the gas industry. *At present the gas industry has no definite reconstruction programme. It is time it had one.* And one of the first items in it should be this subject of raising the standard of manufacturing efficiency by the improvement of coal itself, by grading and washing to the extent demanded by its characteristics. The questions of cost in relation to the results achieved in economy and efficiency, and of improved values, are ones that should receive as early investigation as possible.

Coal Rationing for Gas-Works Preferred.

There have been several indications during the past week of the concurrence of gas men in the southern counties with the views expressed in our editorial article on "Coal Supplies "and Irrational Rationing" [p. 12]. The general opinion is that the rationing of the use of gas by consumers is, as we described it, irrational and unworkable, both from the public point of view and from that of gas undertakings, with their depleted staffs. The question is entirely one of railway transport; and if capacity in this regard cannot be promptly levelled-up (much could be done in this respect by the adequate cleaning of coal), then, until it can be, it would be far better than the existing scheme to reduce, as suggested in our article, the carriage of coal by cutting-off a percentage of the supplies of coal not only to gas and electricity undertakings, but to other concerns as well as to coal factors and merchants generally—continuing the present household coal-rationing scheme, or even further tightening it, so as to ensure the use of coke. By rationing gas, the Coal Controller is unnecessarily penalizing gas consumers in those areas where water-gas plants exist and where the coal-carbonizing plant is of a character that can be worked at a high efficiency, and not only penalizing consumers but himself, for if gas undertakings on their share of coal—presuming that the Coal Controller will ensure their supply, as being of primary importance to the nation as well as to the respective localities—can supply consumers with gaseous or solid fuel, so much the less coal will be needed for household purposes, and all saving in this direction will be the better for the railways. As it is, by the gas rationing process, he is ignoring the resources of some gas undertakings in assisting him in realizing his objects, and is promoting (as Mr. Sidney O. Stephenson points out to-day) the transfer of cooking from gas to coal. The Coal Controller must not measure the supply resources of all gas-works by the plight of those undertakings that acknowledge themselves, and are, in a tight corner under present circumstances. This would be a very fatal mistake in his scheme. Another letter in the "Correspondence" columns, signed "A Southern County Undertaking," agrees with our suggestion that the basis of rationing should at once be shifted from gas and electricity to coal for gas-works and electricity stations; and it mentions a reduction of 10 p.ct. on the 1916 or 1917 basis, whichever is the higher. We will not discuss the percentage, as this really depends on the saving that could be effected in the consumption of household coal by putting to the best possible use the gas and coke resources of all gas undertakings. But naturally we do heartily support the proposal in the letter that the National Gas Council should approach the Board of Trade with the view to the gas and electricity rationing scheme being amended on the lines that were suggested in our article a week ago. If, too, the Coal Controller could arrange for the reduced quantity of coal delivered to gas-works to be of the correct quality, he would be doing something which would enable a number of gas undertakings to render better service in the supply of materials for high explosives and liquid fuel than they are doing now with the larger supply of inferior coal—a point that was made by Mr. Alex. Yuill in his lecture to the Scottish Juniors last Saturday. Mr. Yuill rather thinks that the Coal Controller is ignorant of the fact that gas-works at the present time spend about 50 p.ct. of their total income on coal, which is their raw material. Now that it is mentioned, the Coal Controller might place the information among the items that claim his consideration.

The New Horizon.

The war has considerably changed and extended our outlook in the gas industry. The President of the Informal Meeting of Scottish Gas Managers (Mr. Robert Cowie, of Dalkeith) last week pictured in his address some of the changes, and showed the vast scope of new consideration that lies around. There is nothing new in saying, but it is true, that eventually it will be found that the war has made for more rapid progress of the industry than any of the ordinary developing methods could possibly have done. It has been a teacher of the first order of merit of the usefulness and the potentialities of the industry. In talking of the future and of requirements, the President steered clear of dogmatism on any one point. Lines of action in connection with the new calls on the gas industry must be chosen with discrimination. For instance, speaking of the fact that money and material are scarce and dear, he pointed out that these are conditions that are likely to continue for some time after the cessation of hostilities; and, this being so, it will be for every engineer to carefully consider and decide whether new works or alterations to existing plants should be adopted. Prices of money and of material are not the only considerations that will have to enter into the determination of whether new plant should be constructed, or extensions of old should be carried out. A greater consideration is as to the type of plant that will be best suited for the gas that investigation approves from every economic standpoint. It holds good for the country as for the gas industry that, if the greatest progress is to be made, and the maximum prosperity is to be attained, all sources of wastefulness must be speedily eliminated and economy planted in their place. Nothing has been more vividly demonstrated during the war than the extraordinarily barbaric waste that has been tolerated by this country in allowing bituminous coal to be consumed without extracting from it its many valuable possessions other than heat units. In the revelation and now popular appreciation of this, there is unprecedented opportunity for the gas industry—not only with gas, but with coke. The improvement of the latter must not be overlooked. We can improve it through the washing of coal. Through washing, ash and sulphur (and with the sulphur goes the arsenic) are removed; and so the coke is bettered. Mr. Cowie thinks that part of the coal might be so carbonized as to leave a little more volatile matter in it, in order to improve its claims as a domestic fuel, and treat the gas as a secondary product. This depends upon local conditions and preferences.

In relation to the other secondary products, it is common sense to save railway transit as much as possible. If tar has to take a somewhat distant railway journey to the tar distiller, and the tar distiller has to return the dehydrated tar to the locality of the gas-works for use on roads or for other purposes, there is not economy in the proceeding. If ammoniacal liquor is sent to a distance for conversion into sulphate of ammonia, and then the product requires to be returned to the farmer in the area in which the gas-works are situated, there is not economy in that—if there are means of avoiding the journeyings and the attendant costs. The labour as well as the railway carriage have to be paid for; and the payers are the producers of the raw material and the consumers of the finished product. Naturally considerations under this head led to the mention in the address of co-operative distillation plants. But Mr. Cowie seems troubled by the question of capital expenditure; and he thinks that a good deal more could be done than has been done by bargaining with the tar distillers. This may be so. The tar distillers, or some of them, appear now to be a little uneasy in mind as to whether they have done all that they might have done in establishing good relations with the producers of tar. They do not like the, for them, ill-omens of the tar distillation plants that are being put up here and there in proximity to the tar storage on gas-works; nor do they like the talk as to co-operative distillation plants for the small works. But agreements with the tar distillers do not eliminate the uneconomy of carrying crude tar, if avoidable, on railway journeys. There is in most districts the alternative of entering into arrangements with the nearest large gas-works with a distillation plant, if a tar distiller is not a nearer neighbour.

Within the new horizon of the industry, there are other matters as to which the war has accentuated importance—the training of men for staff positions, the education and training of workmen, and generally a better surveillance of the interests of the whole industry. Scotland has now its own Gas Council working in alliance with the National Gas Council. Its establishment is all part of the appreciation that has come that things now are not as they were, and that the gas industry has to move not according to the dictates of a past day, but according to the indications that have thrust themselves upon our notice with marked distinctness, and have stimulated thought.

Efficiency at the Top.

There is one feature that we like above all others in the address that Mr. C. E. Teasdale, of Salford, delivered to the Manchester Junior Institution on Saturday last; and it is that it is an outspoken recognition of what is required from, and must be supplied by, the junior staff members of the industry, who are the men who are to succeed to full responsibility under conditions which, through the mutability produced by time, progress, and war, will find no likeness in the past. When we have men in the second and third lines of the official staff recognizing this, and themselves taking steps to qualify for the front line under the altered circumstances, there is a satisfactory indication that they themselves feel the responsibility of the obligations which will become theirs. This clearly augurs well. The address throughout pointed to the importance of "scientific man-"agement" and "efficiency." These are terms that cover all things from the *alpha* to the *omega* of gas-works operations; but the fact that it is so is to their own disadvantage sometimes forgotten by men who cultivate a single point of view. Efficiency must reside first in the chief executive official; otherwise we cannot expect the scientific management that will promote efficiency throughout men, plant, and materials, as well as trading generally, whether buying or selling. Thus the importance of efficiency at the top; and this efficiency, as we say, will in future be required in accentuated degree and form. Immediately, too, there will have to be a good deal of relinquishing of old ways and adopting new ones; points of view will have to be changed; and new methods will have to be applied—in all directions. Otherwise men or undertakings will be going under.

We have heard of cases lately where considerable inefficiency has been asserted to have been found in gas management—sometimes showing its effects in plant, sometimes in methods, sometimes in results, sometimes in the treatment of staff and men. Efficiency of plant and results very much depends on the attitude of staff and men; and the attitude of staff and men is very much determined by the treatment accorded them by their superior officers. Men are not thin-skinned; but they are men, and not dogs. A Government official told us not long ago that he was surprised at the differences in the demeanour of men at different gas-works and in the conditions of the works themselves, and he traced these back to the attitude of the management towards the men. Scientific management and efficiency (which include humane consideration) in this direction is as necessary as in any other. The truth is attested by many an object-lesson in the industry. There will be chief officials who will smile and ridicule. Let them. The day will probably come when they will not either smile or ridicule, but will remember these words. The interests of employers and all the employed are common; unity of interest between employers and employed does not end at the chief official. There is going to be a good deal of reform in the industry. We are aware of administrators who know the industry well, who know its many needs, and who see that the provision for the official ranks of the industry for the future must ascend, not only in numbers, but in general qualification; also that men occupying important positions on the staff—positions which play a large part in economy through the promotion and maintenance of efficiency—shall have proper recognition, and not be kept behind a screen. Reconstruction is now in the air. Reconstruction there will be in the gas industry, which is recognizing more and more the vital importance—and necessity—of "scientific management and maximum "efficiency." The juniors, whose mouthpiece Mr. Teasdale was, are appreciating that upon scientific management and maximum efficiency the stability of the industry rests. This appreciation is a great gain.

The Co-Partnership Controversy.

The wages award of the Committee on Production has considerably altered the aspect of the ground of controversy over the

basis of co-partnership, and as to whether the Gaslight and Coke Company's change to equality of bonus and ordinary dividend is logical or illogical, natural or unnatural. It is pretty certain that, whatever may be said one side or the other, it will be many a long year before, on the ordinary co-partnership scales, the old amounts of annual bonus will again be set to the credit of employee co-partners. Mr. Charles Hunt, who criticized the dividend basis [see March 26, p. 591, and April 2, p. 19], and Mr. Charles Carpenter, D.Sc., who agrees with him in our "Correspondence" columns to-day, are well aware of this; and we rather think that the many lean years that are before the co-partners in respect of bonus on the ordinary scale will give the co-partners receiving bonus with dividend equality good compensation for some years to come for the distant loss of an ultimate higher bonus on the old lines. The South Metropolitan Gas Company point out in their "Co-Partnership Journal" that "to revise our own scheme" on the Gas Light Company's lines "would mean that when the shareholders' dividend gets back to (say) £5 9s. 4d. as in 1914, the bonus on wages would also be at that rate, instead of at the rate of £8 5s. (8¼) p.ct., as it was in that year." This may be so. But we pause over the "when," and reflect upon the fact that it was only less than four years ago that the South Metropolitan Gas Company's men were getting £8 5s. p.ct. and are receiving nothing at all to-day. The £8 5s. (solid as it was) has rapidly melted away; and the proprietors are still receiving some dividend. It is argued that wages without the co-partnership bonus are the equivalent of the dividend paid to the ordinary proprietors—the time and labour of the men being the equivalent of the capital of the latter. Then why was a bonus given at all; and why was the term "co-partner" not applied before the "co-partnership" scheme was introduced? The real reasons that induced the introduction of a co-partnership bonus exist in war years as in peace years, perhaps more so, but there is no bonus for a great bulk of the employee co-partners. Applications are being made for the readjustment during war times of the sliding-scale, but not of the co-partnership scale. We are not arguing that, under the altered wage conditions, any revision is requisite in order to give title to a bonus whatever its basis; and the Gas Light Company will find now that, in the aggregate, the bonus payable on wages under the equality-with-dividend scheme will be greater than before the award of the Committee on Production was issued.

Steaming and Inerts.

The Scottish Junior Gas Association (Western District) had a very illuminating lecture by Mr. Alex. Yuill last Saturday, which will give them abundant suggestion for thought and practice—and not only them, but some of their elders. Among other matters, it is seen that Mr. Yuill is an enemy of avoidable inert constituents in gas, and a believer in adopting those methods that will reduce them to the lowest point, and send the best possible combustible gas through plant and mains to the point of combustion. Every well-balanced mind will appreciate the economy and other advantages of this. Progressive knowledge has produced enlightenment on this subject. Under certain conditions, there is no need, Mr. Yuill points out, for even the 12½ p.ct. of inerts suggested by Mr. John West in a letter published in our columns. This may be the minimum that can be reached with horizontal working; but with vertical retorts and superheated steam, it may be reduced by 50 p.ct. In the decomposition of the steam, the hydrogen while in the nascent state combines with the nitrogen to form ammonia, and the oxygen with the carbon to form carbon monoxide. There have, on two or three occasions, been suggestions that tests should be made with the introduction of blue water gas at high temperatures instead of steam. Mr. Yuill revives the matter; and theoretical considerations lead him to the belief that in practice good results would be found. But he, like many more, awaits the information from working trials.

National Kitchens.

Editorial reference was recently made to this subject; and, from the information then given, it is clear that the manufacturers of gas-using appliances have this matter well in hand. It will be remembered, too, that the electrical papers were doing their best to spur the manufacturers of electrical appliances, as well as the suppliers of electricity, into what they considered as being a fit and proper recognition of the importance of the movement. Since then it has been announced that Mr. W. A. Gillott "has joined the Ministry of Food in connection with electric cooking apparatus for national kitchens." It will be within recollection that Mr. Gillott was the author of a paper (which has been much discussed by electricians up and down the country, and which has been commented upon from time to time in our "Electricity Supply Memoranda") on electric appliances for large kitchens. One of our electrical contemporaries welcomes the appointment as an indication that somebody is waking-up. There are, however, various things Mr. Gillott cannot do. He cannot increase the output capacity of the manufacturers of electrical appliances; he cannot cheapen the production of the appliances; he cannot enhance their reliability; he cannot make a unit of electricity render more than 3420 B.Th.U. Still he will no doubt do his best for the electricity supply industry, as he is convinced of the soundness of the doctrine as to less meat shrinkage by electric-ovens when these are regulated to low temperatures as compared with gas-ovens when these are run at high temperatures! An electric *cum* steam national kitchen was started the other day at Poplar; the Electricity Department supplying the current at a cheap rate, as is the wont of electricity departments when they see advertisement attaching to the transaction. The kitchen was inaugurated by Lord Rhondda, who stated that Alderman Spencer, who is in charge of the National Kitchen Department of the Ministry of Food, expects that within two months from then there will be established throughout the country no less than 1000 National Kitchens, and within three months 2000. A very large proportion of these should be fed from gas-mains. The hope was also expressed by his Lordship that, while these kitchens were a war insurance, they would become permanent in some districts.

Co-Operative Research Enterprise.

Not much has been heard lately of the plans of the Department of Scientific and Industrial Research as to the formation of Research Associations. One of the difficulties about such Associations is the basis of contribution to their support. There are some firms who are very liberal in the support of enterprise which will make for industrial progress; there are miserly and selfish firms who are willing and ready to enjoy the fruits of such enterprise without taking any share, or a very small one, in the expense. The Department have been looking round for a basis on which the constituent firms of Research Associations should be assessed for contribution purposes. Several proposals have been considered, and rejected owing to some defect. They have submitted the one which appears to them to be the least open to impeachment. The Memorandum suggests that, on the whole, the most serviceable basis may be the capital of the firms; and on this basis it is proposed that works should be classed in groups with capital ranging between defined limits—closer for the smaller establishments, and wider for the larger enterprises or combinations. Each firm in a capital group would pay the same subscription. It is, of course, easy enough to find objections to capital as a basis. But it is generally the least offensive one; and on that ground, unless something better and not yet considered is forthcoming, it should be accepted. Anyway, in the same line of business, capital should be a fair measure of resources; and the benefit of the fruits of any research will be on lines that are approximately commensurate with the resources. Thus graduated subscriptions based on capital have some argument in their favour. An alternative suggestion is that, where in an industry there is a comprehensive Federation already possessing a basis of subscription, the latter could be increased for the purpose of the Research Association, and so make only one assessment and one collection. It is not expected that the Research Associations will in anyway interfere with private research by firms. This must still go on in each firm's own interests. We have not heard of the gas industry having taken any special steps in this direction, other than what is being done in conjunction with the Fuel Research Board and in connection with refractory materials. But let it not be forgotten that research is the industry's chief highway to progress and expansion.

Midland Association of Gas Engineers and Managers.—At the annual general meeting to be held in the Grand Hotel, Birmingham, on Thursday of this week, Mr. W. Chaney will deliver his Presidential Address; and, in addition to formal business, provision is made on the *agenda* for the discussion of "impromptu" matters.

PERSONAL.

Mr. J. W. BROADHEAD, of Elland, and Mr. H. E. BLOOR, of York, have been appointed Temporary Captains in the West Riding Motor Volunteer Corps.

The Military Medal has been awarded to Private A. TANNER, of the East Yorkshire Regiment, who prior to joining the Army was on the staff of the Keighley Corporation Gas Department.

Mr. JOHN BRODIE has been appointed Manager and Collector to the Coupar Angus Gas Company, in place of Mr. W. INGHAM, who goes to Berwick-on-Tweed. Mr. Brodie, who was trained at Dalkeith, has been for over two years Manager to the Aberfeldy Gas Company.

Sympathetic interest has been aroused in Nottingham by the intimation of the intention of Alderman A. BALL (an ex-Mayor and Chairman of the Gas Committee) to erect, upon a site in the Lenton district, with which his family have been long associated, homes for mothers and widows of men who have fallen in the war, as a memorial to his son, the late Captain Albert Ball, V.C., of the Royal Flying Corps, who was killed in France. The management of the scheme, upon which he proposes to expend about £10,000, will be placed in the hands of trustees.

The appearance of an advertisement in the "JOURNAL" last Tuesday, for an Engineer to the Sheffield Gas Company, will have prepared readers for the announcement of the retirement of Mr. J. W. MORRISON. But they will be sorry to learn that he has tendered his resignation because he feels that he cannot stand the present strain, and that he must give up to avoid a collapse. Some two years ago, it may be recalled, Mr. Morrison suffered a great blow in the death of his wife. Last December, too, he had to go into a nursing home for an operation; and since then he has not been himself. In tendering his resignation, after being for nineteen years with the Sheffield Company, Mr. Morrison (who is in his fifty-eighth year) is doing what, in normal circumstances, he had made up his mind to do about two years hence.

Major ALAN STEIN, M.C., of the Argyll and Sutherland Highlanders, attached to the Gordon Highlanders, has gained a Bar to the Military Cross, "for conspicuous gallantry and devotion to duty when in command of a company in an attack. Accompanied by one non-commissioned officer, he captured a concrete post and eleven prisoners. He led his company forward to the final objective, which he gained and held against strong counter-attacks. He was responsible for, and maintained, communication with the division on his right throughout the action." Major Stein was wounded for the third time on Dec. 19; and after ten weeks in hospital, left again for France. He is a Director of Messrs. John G. Stein & Co., Ltd., of Bonnybridge and Castlecary; and to commemorate the distinctions conferred upon him, the employees of the firm presented him with a gold hunter watch.

Mr. JAMES BRIDGE, Assistant to Mr. H. Kendrick, Engineer and Manager of the Stretford Gas Company, has been appointed Manager of the Lum Street Gas-Works, Bolton, under Mr. W. J. Smith, B.Sc., Engineer and Manager of the Bolton Corporation Gas Department. Mr. Bridge has been with the Stretford Gas Company for ten years, and for the last six has been Chief Assistant. Since 1913 he has been Hon. Secretary to the Manchester and District Junior Gas Association. A report of a presentation made to him by the members of the Association last Saturday will be found in another part of this issue. On the occasion of his recent marriage, the officials and employees of the Stretford Gas Company have presented him with a canteen of cutlery. Members of the Manchester Junior Gas Association are asked to note that all communications on Association business should, on and after April 23, be addressed to Mr. Bridge at the Lum Street Gas-Works, Bolton.

OBITUARY.

Mr. JOSEPH NICHOLSON, the Chairman of Messrs. John Nicholson & Sons, Ltd., chemical manufacturers, of Hunslet, Leeds, succumbed, after a few days' illness, to an attack of pneumonia. He was 70 years of age.

Mr. JAMES HALTON, who died on Good Friday, and was interred at Stopey Royd Cemetery, Halifax, was for over twenty years Manager of the Repairs Department of the Halifax Corporation gas undertaking. He was a native of Lancashire, but had become closely attached to Halifax life.

Mr. SPENCER CHAPMAN, whose death has occurred, at the age of 75, founded about half-a-century ago the firm of Spencer Chapman, and Co., sulphuric and muriatic acid manufacturers. Afterwards, the firm became Messrs. Spencer Chapman and Messel, Ltd.; and ultimately an amalgamation was effected with Messrs. (now Sir) William Pearce & Sons, Ltd. The works are at Silvertown and Bow.

Gas-Traction Inquiry.—The Inter-Departmental Committee on Gas Traction have completed the first stage of their inquiry; and the interim report will shortly be furnished to the Petroleum Executive for submission to Mr. Walter Long.

TAR OILS RESEARCH.

A Government Award of £2000 Offered.

IT has been decided by the Government to issue an award for research regarding tar oils, in accordance with conditions set forth in the following memorandum, received from the Department of the Controller of Munitions Mineral Oil Production.

His Majesty's Government are prepared to pay the sum of £2000 to the first person or persons who, on or before Aug. 1, 1918, can obtain to the satisfaction of the Lords Commissioners of the Admiralty and H.M. Petroleum Executive a fuel-oil suitable for Admiralty use by admixture of dehydrated coal tar with mineral petroleum oils, subject to the following conditions:

(1) The coal tar product to be employed shall consist of dehydrated tar. For the purpose of this specification, the expression dehydrated tar shall mean all crude coal tar produced by gas-making retorts or coke-ovens following the normal gas-making or coke-oven practice now in use, after undergoing treatment to remove water and light oils to such extent that the tar on distillation with thermometer in vapour does not give more than 1 p.ct. of water and more than 1 p.ct. of oils distilling below 170° C.

(2) The mineral petroleum oils to be employed will be in accordance with the Admiralty specification for fuel oil, and may be derived from the following sources:

U.S.A Gulf Fields.	Persia.
U.S.A. Northern Fields.	Borneo.
Mexico.	Burmah.
Trinidad.	United Kingdom.

(3) The process to be employed shall be such that it will utilize at least 95 p.ct. of the original dehydrated tar.

(4) The composite fuel produced by the admixture of dehydrated tar with mineral oils must:

(*a*) Comply with the Admiralty specification for liquid fuel.

(*b*) While standing in an exposed place in an open vessel for a period of at least one month at normal atmospheric temperature, no deposit shall be thrown down, after which the whole of a quantity of not less than 20 gallons must pass through steel gauze 32-mesh to the linear inch having an area of 1 sq. in. inserted in an open funnel 12 in. deep, without choking the gauze at all temperatures between 60° and 200° Fahr.

(*c*) Be capable of combining in all proportions with the mineral oils described in Clause (2), so as to obtain a suitable Admiralty fuel.

(*d*) Prove capable of being used in the Admiralty type of burner under service conditions without depositing carbon or other matter to such an extent as to choke the jets or to hinder the proper working of the burners.

(5) It is desired to use the highest proportion of dehydrated tar possible in the mixture, and no mixture will be regarded as satisfactory which contains less than 33 p.ct. of dehydrated tar.

(6) There will be no objection to the use of a third ingredient in order to form a suitable compound or emulsion, provided that the addition of any such ingredient does not cause the fuel to fail to comply with the Admiralty specification for fuel oils, nor reduce the calorific value of the fuel more than 1 p.ct. below the mean calorific value of the dehydrated tar and petroleum used in the mixture. Any such third ingredient must be readily obtainable in sufficient quantities in this country at a reasonable cost; also, if obtained from coal tar, it shall not be used in a greater proportion than 5 p.ct. of the dehydrated tar with which it is being mixed.

(7) Any process suggested must be of such a nature that, in the opinion of the Admiralty and the Petroleum Executive, it can be readily and economically applied at the present time without absorbing an undue amount of labour and materials.

(8) The necessary samples of tars and mineral oils will be provided to responsible persons free of charge by His Majesty's Government.

(9) The Admiralty and Petroleum Executive must be satisfied that the methods proposed are in every way practicable, and will enable large quantities of dehydrated tar to be used; also that the fuel produced is capable of being stored, handled, and satisfactorily pumped and burned in the same manner as the fuel now used in the installation of a warship at sea. The right of making such tests and trials as appear desirable to prove this is reserved.

(10) In the event of any person or persons achieving a partial solution of the problem, and producing a fuel which might prove useful for Admiralty purposes without fulfilling all the above conditions, His Majesty's Government reserves the right to make an award of such part of the above-mentioned sum as may appear desirable.

(11) The decision of His Majesty's Government as to any question arising hereunder, whether in connection with the bestowal of the award or any part thereof, or otherwise, shall be final and binding on all parties.

(12) In order to prevent possible anticipation during the period of investigation, it is open to any competitor for the award to apply for letters patent when submitting his process for investigation, on condition that if he subsequently secures the award, or part of it, His Majesty's Government shall have free use under the patent.

(13) His Majesty's Government will assist the inventor in obtaining patent rights in Great Britain in regard to any patentable process which may be judged worthy of the full award, but shall be entitled by itself, its agents, contractors, or others, to use free of royalty or other charge any invention so patented in so far as may be required for Government purposes.

(14) If any improvement in a process securing the award be subsequently effected with the collaboration of His Majesty's Government, or any of its officers, the department or officer concerned shall be associated in any patent which may be taken out to protect such improvement.

(15) All communications with reference to the foregoing offer should be addressed to The Controller, Munitions Mineral Oil Production Department, No. 8, Northumberland Avenue, W.C. 2.

GAS-WORKERS' WAGES.

Award of the Committee on Production.

The award has now been issued by the Committee on Production (and is set out below), in the arbitration which took place, under the presidency of Sir George S. Gibb, as recorded in the "Journal" a fortnight ago [p. 580], arising out of a claim for a general advance in wages put forward on behalf of workers engaged in gas undertakings.

COMMITTEE ON PRODUCTION.—GAS WORKERS.

1.—The present award is in respect of an application made by the National Federation of General Workers on behalf of their members employed by gas undertakings. The undertakings were represented by the National Gas Council and on behalf of Birkenhead, Blackburn, Leigh, Manchester, Oldham, Rochdale, Salford, Stockport, Wallasey, and Wigan by Mr. J. V. Jackson, K.C.

2.—The claims submitted were:

(i.) An advance of 10s. per week to adults on the rates of wages paid on Jan. 1, 1918, with a minimum war wages advance of £1 1s. for all workers of 18 years of age and over—*i.e.*, an advance of wages of 1s. 8d. per day or per shift, or a minimum war wages advance of 3s. 6d. per day or per shift, *plus* 12½ p.ct.
(ii.) An advance of 5s. per week to juniors.
(iii.) Where women are employed upon men's work, the same advance of wages to be given as that to men.
(iv.) For all time worked on Sundays, Christmas days, Good Fridays, Bank Holidays, and in the case of Scotland National Holidays, double time shall be paid.
(v.) Other conditions to remain as customary.
(vi.) The advances to be paid on the first pay day following Feb. 4 for the week previous, and thereafter.

3.—The matter was referred by the Ministry of Labour to the Committee on Production for decision. Representatives of the parties were heard on March 21, 1918.

4.—The Committee have given careful consideratfon to the statements and arguments submitted to them; and their award is as follows.

I.—Wages, Etc.

5.—That in the case of undertakings where the general advances (including bonuses, but excluding advances arranged before Aug. 4, 1914, but coming into operation after that date) given since the outbreak of war to the male employees aged 18 years and over amount to 16s. per week and upwards, but are less than 20s. per week, there shall be paid such further increase as shall make the advances up to 20s. per week over pre-war rates, payable at the rate of 3s. 4d. per day or per shift for each day or shift worked.

6.—That where the advances amount to less than 16s. per week, the men concerned aged 18 years and over shall receive a further increase of 4s. per week; the payment of such amount, together with the existing advances, to be made on the basis of a week of six days or six shifts.

7.—The Committee make no order in respect of women, having regard to the Statutory Rules and Orders made by the Minister of Munitions in accordance with the Munitions of War (Amendment) Act, 1916.

8.—Boys and youths under 18 years of age shall receive an advance of 2s. per week (payable at the rate of 4d. per day or per shift for each day or shift worked), subject to a maximum advance of 10s. per week over pre-war rates.

9.—The amounts hereby awarded are to be taken into account in the calculation of payment for overtime or night duty or for work on Sundays and Holidays, and are to be regarded as war wages and recognized as due to, and dependent upon, the existence of the abnormal conditions now prevailing in consequence of the war.

10.—The advances hereby awarded are to be paid as from the beginning of the first full pay following March 21, 1918.

11.—The Committee award no change in the conditions at present prevailing in regard to time worked on Sundays and holidays.

II.—Bonus.

12.—The award of the Committee is that the workmen concerned, of 21 years of age and over, who are paid at plain-time rates, shall, as from the beginning of the first pay following March 21, 1918, receive a bonus of 12½ p.ct. on their earnings, which shall not alter or become part of their time rates.

13.—Clause 12 of this award shall not apply to any workmen who receive in addition to their plain-time rates any bonus or allowance other than such bonus or allowance as would be covered by the provisions of section 3 subsections (*a*), (*b*), and (*c*) of Order 1301, if the men concerned had been within the terms of such Order, provided that, if any such bonus as is mentioned in subsection (*b*) is less than the bonus granted by this award, such first-mentioned bonus shall cease, and in lieu thereof the workmen concerned shall receive the bonus granted by this award.

14.—To workmen of 21 years of age and over who are piece workers, or are paid on a premium bonus system, or any mixed system of time and piece, or any system of payment by results, including men working at augmented time rates fixed in lieu of piece rates, or by reference to results or to output of work, a bonus of 7½ p.ct. on their earnings shall be paid as from the first full pay following March 21, 1918.

15.—Any bonus or war advances which, in the case of time workers, have merged in the 12½ p.ct. shall merge in the 7½ p.ct. now awarded.

16.—This award does not apply to workmen paid a wage or salary not dependent on time worked, or an upstanding wage or salary which covers overtime or other allowances.

17.—If any payment has been paid to workmen pending the general consideration of their position in relation to the bonus of 12½ p.ct. and 7½ p.ct., whether by agreement or as a result of arbitration, the amount of such payment shall merge in the bonus awarded under clauses 12 and 14 of this award; and such bonus shall, as from the date fixed by clauses 12 and 14 of this award, be in lieu of, and in substitution for, any such other payment.

(Signed) George S. Gibb.
J. Duncan Elliot.
F. S. Button.

H. J. Wilson, Secretary.

5, *Old Palace Yard, S.W.* 1.
March 27, 1918.

ELECTRICITY SUPPLY MEMORANDA.

The men of the electricity supply industry have a great deal of veneration for their lighting business. It is the branch that supplies the backbone of revenue through the relatively high price per unit; it is the branch that, if there are any net profits, does so much to make them. But it happens to be the branch that will, in London and the Southern Counties, come mostly under the five-sixths private consumption rationing order, as well as the regulations in regard to shop-lighting, and hotel, restaurant, and club dining-room lighting. If, too, there is any saving effected by the new rules as to the closing of the houses of entertainment (which is a matter over which the managers of these places wink their eyes when out of sight of the Coal Controller and the President of the Board of Trade), this will also affect the good paying lighting load. Down-South many of the provincial electricity undertakings have little else but lighting consumption. What is worse, they do not find—taking into consideration capital expenditure—that the smaller property is anywhere worth supplying in view of the lowness of the consumption, especially during summer time. Consequently, they regret to see the compulsory relinquishment of even one-sixth of the lighting business with the better-class consumers, including the electricity patronizing shopkeepers. If the electric heating and cooking load were sufficient for the purpose, the managers of the supply undertakings would rather see the one-sixth part of the consumption taken off the cheap units supplied for these purposes. But the cooking consumption is almost of negligible quantity, and the heating consumption so very erratic—cold weather tortures people into the use of their heating agents—that these directions cannot be relied upon as effective contributors to the reduction that authority has ordained shall be made. The basis of heating consumption has this last winter been reduced by the comparative mildness. If the winter had been of the severity of the 1916-17 one, it might have been taken as one of maximum order from which, at any rate, one-sixth part of the consumption could be saved. But it has been decreed otherwise.

The Five-Sixths Decree.

There have been a few peculiar suggestions in the papers as to how the consumption of gas and electricity can be lessened. But most of the suggestions depend first upon a previous extravagance, and secondly the questionable aptitude of the same extravagant persons for exercising rigorous economy. The suggestions are no use whatever to the householders or the shopkeepers who have already been mindful of the small things in connection with economy in lighting and heating. Beyond this electrical men see (the same as gas men) the difficulties confronting consumers as to how to control their consumption in order to ensure the one-sixth reduction. Assuming they can read the meters, it is absurd to tell them to take the number of units consumed in the corresponding quarter ending (say) in March, deduct one-sixth of the amount, and divide the result by thirteen, and then not to exceed week by week the amount so ascertained. But in January the quantity required per week for lighting is considerably more than during March; and—this has application more to gas than to electricity—the variations of atmospheric temperature may be very great day by day or week by week. The householder has no safe guide upon which to proceed. A master or mistress, too, cannot stand guard hour by hour over the heating and lighting uses by servants; and a working man or woman cannot stay away from work and make a living out of the economy in the use of gas that his or her presence would ensure on the part of the other members of the family. It would be an excellent thing if the Coal Controller would compel the disuse of electric-heaters in view of the small thermal value of the unit of electricity generated by the expenditure under the steam-boilers of the large number of heat units in the coal consumed. The "Electrician" is of opinion that, so far as electric lighting is concerned, the authorities have an exaggerated idea as to the amount of coal used for the purpose. The authorities have before them fairly reliable average figures which tell them that, while in some places 2 to 3 lbs. of coal are burned per unit of electricity, the average consumption is about 4½ lbs., giving 800 candle-hours for domestic lighting, or only 3420 B.Th.U. for heating, and nothing else, which has no comparison with the diversity of products from the coal carbonized in gas-retorts. The authorities would not have much difficulty in showing our contemporary confirmation of their ideas. However, on the main question, it is very doubtful indeed, in the circumstances, whether the five-sixths decree will long survive any practical test, and another plan will have to be devised, some views in regard to which were expressed in our editorial columns last week.

Consumers' Puzzles.

Desire for Activity at Both Ends.

While the electricity supply industry is busy making for itself a sort of maze of schemes intended to produce generating economy, which is a very laudable ambition if intelligence compasses all the problems, some doubt appears to exist in the mind of the Electrical Correspondent to the Engineering Supplement of "The Times" as to whether all is being done that should be done to work-up demand for current. He is evidently one of those gentlemen who want to make pace too quickly. He thinks that the electricity industry should be showing great activity now in the cultivation of new markets. The reason he is of this opinion is that a very large amount of plant has been brought into use for munitions work; and he has very wisely come to the conclusion that it should not be accepted as a kind of natural law that factories will require new equipment at the same rate as they have been doing during the pressure of production for the war. Therefore, vigorous propaganda are necessary to ensure due extension of the industry. One would imagine that the production of greater economy in electricity generation ought first to be assured, as this is the main factor in the industry's commercial expansion. Given cheaper electricity, extension of the trading limits should proceed at a splendid rate. But the professional men who write and talk in columns on this subject of cheaper electrical current appear to ignore the effect that the war is having in the way of putting spokes into their ever-revolving wheel of ambition. Everything—capital, material, and labour—appertaining to new construction will for years to come cost more than pre-war rates, and so will labour, fuel, and all other materials and goods required in generation and trading. These things must discount for a period not yet measurable the economical results of any scheme whatever its form. Thus it is seen that the war has not supplied the industry with a good base for its main aspiration, the attainment of which has a variety of paths mapped out for it, each of which is by equally competent electrical brains voted the best and the easiest travelling.

Electricity v. Coal—Mr. Bailey's Data.

Interest attaches to the addresses of Mr. J. B. Braithwaite to the shareholders of the City of London Electric Lighting Company, as he generally includes in them data which are instructive if not always immune from criticism. On a previous occasion, we had some strictures to offer regarding certain comparisons that he, according to our calculations, unfairly made between the performances of gas and electricity—of course, to the detriment of the former—and to which strictures neither Mr. Braithwaite nor Mr. Frank Bailey replied, though both had the fullest opportunity of doing so. At the recent meeting, the relation of electricity to coal consumption supplied the Chairman with material for part of his address; the figures he quoted, he was careful to say, having been supplied to him by Mr. Bailey. Being a comparison with coal, our interest, of course, is not so great; but, unfortunately, we cannot make some of the figures square with the facts. At the same time, we are not defenders of the direct use of coal for heating in any shape or form, though the City of London Electric Lighting Company burn a considerable quantity under their steam-boilers for the generation of current, while urging that other people should employ electric motors, and not steam plant. We do not deny that for certain operations this is not right, while at the same time suggesting that a large user of current for both power and lighting could *in situ* produce the current by private plant at an average cost per unit below what he would probably have to pay to the City of London Company for lighting and power. However, this by the way. These are the figures quoted by Mr. Braithwaite:

> Eighteen years ago we used 78,000 tons of coal to produce 14,700,000 units; we now require only 41,000 tons of coal to produce about 36,000,000 units. In other words, whereas we formerly obtained only 188 units per ton, we now get 878 units, or about four-and-a-half times more. Then as regards lighting. When we started as pioneers, 1 unit of electricity gave 250 c.p. for one hour; now we get 2000 c.p. out of the same expenditure of electric current. Last year, for heating, we supplied nearly 4½ million units—this being used in about 8500 electric radiators, which replaced coal fires, which in the ordinary way would have required 12,000 tons of coal. Instead of this 12,000 tons, we have given a better result by using 4500 tons of coal, or a saving of 7500 tons of coal in heating alone. For power we sold 11,416,000 units last year, by which we saved about 45,000,000 tons of coal annually to the nation. The Coal Controller, in seeking to cut down the coal consumption of the electric supply undertakings, is tending to increase the consumption of coal rather than to diminish it, because every ton we burn, whether the current it produces is used for lighting, heating, or power, is doing work which otherwise would only be done by a very much greater expenditure of coal.

First as to the claim that one unit of electricity will now give 2000 c.p. Not to the users of ordinary lamps. Ordinary metallic filament lamps will only give per unit 800 candle-hours. It is not the so-called "half-watt" lamp, as photometrical tests show the efficiency to be nearer one candle per 0·75 watt. Therefore with this lamp the duty realized per unit would be about 1333 candle-hours. Perhaps Mr. Bailey will correct any inaccuracy in our calculations. Then 4,500,000 units were consumed by electric radiators, which are alleged to have given a "better result" than 12,000 tons of coal would have done used in coal grates. The 4,500,000 electrical units are equal to 15,390,000,000 B.Th.U. Assuming 14,000 B.Th.U. per lb., 12,000 tons of coal are equivalent to 376,320,000,000 B.Th.U.; and, allowing modern coal fires 20 p.ct. efficiency, the heat units usefully employed in warming rooms would be 75,264,000,000 B.Th.U., as against the 15,390,000,000 B.Th.U. rendered by the electric-radiators—if absurdly conceding them 100 p.ct. efficiency. How the "better result" is derived is not clear. Taking now the 4500 tons of coal used to generate the 4,500,000 units employed for heating, and assuming 14,000 B.Th.U. per lb., the coal would represent 141,120,000,000 B.Th.U. expended to produce the 15,390,000,000 B.Th.U. of the 4,500,000 electrical units! Twenty per cent. of the B.Th.U. of the 4500 tons of coal—20 p.ct. being the efficiency of the coal grate—would be 28,224,000,000 B.Th.U. We fail to find the better heating result by the use of electric radiators than by the use of the same quantity of coal in fire grates. By the way, the heating figures submitted by Mr. Braithwaite make a claim of 1000 units produced per ton of coal, while earlier he claimed for the Company's generating plant 878 units per ton. On the latter basis, the 4500 tons would yield 3,951,000 units, not 4,500,000 units. Apparently therefore no coal was used for generating the balance of 549,000 units. If there is cause for complaint over the Coal Controller cutting-down the supply of coal to electricity undertakings, how much greater is there cause in the case of gas undertakings with their large variety of products from the coal they carbonize.

Maximum Price Increases.

Some electricity supply undertakings are agitating for a revision of their maximum prices—the same as gas undertakings are doing not only in connection with maximum prices, but sliding-scale charges and dividends. The Frinton-on-Sea Electricity Company are anxious to increase their maximum from 7d. to 9d.; the District Council are equally as anxious they should not do any such thing, for, or at any rate not longer than, the duration of the war. But the interesting point about the application is that, according to a published paragraph, the Council have learned that, if the application is granted, it will have effect for five years, which suggests that at all events one Government Department is hopeful we shall have polished off the war before many more years have taken flight.

Light Oil Recovery and Naphthalene at Cambridge (Mass.).

During the last three years, the Cambridge (Mass.) Gas Company have been washing their coal gas with water-gas tar, to remove some of the naphthalene; the washing being carried out in a Holmes rotary machine, and the tar pumped to the storage tank and sold. This tar, it was explained by Mr. Isaac T. Haddock, in a paper read at the meeting of the New England Association of Gas Engineers, carried from 3 to 4 p.ct. of light oil, which it was found could be cheaply extracted by means of a small still, leaving a distilled tar which was more valuable for road purposes. Nearly twelve months ago, they began to wash the coal gas with gas oil, instead of water-gas tar; 1300 gallons of oil (or 1 gallon per 1000 c.ft. of gas) being pumped into the rotary washer twice in every 24 hours. The first distillations showed about 6 p.ct. yield of light oil, which was due to gas oil carried over with the steam. After the oil had circulated through the washer two or three times, the yield dropped to 3 or 4 p.ct. Tests showed that the oil-washing very greatly reduced the naphthalene and the sulphur compounds in the coal gas; but unfortunately they could only wash the coal gas, and the 500 B.Th.U. water gas contained as high as 30 grains of naphthalene. Trouble arose in the services; and the light oil on hand was run through a steam-jacketed heater—most of the benzol so obtained being driven into the main at the outlet of the governor, which changed the deposit to small flakes. Then kerosene was put through the heater, at the rate of 50 gallons a day. The first 1000 gallons disappeared, and no trace of it was seen in the drip; but the second 1000 gallons showed in the drip about 200 yards from the holder. After kerosene was put in, the naphthalene dropped at the works faster than it did up-town, which led to the belief that the kerosene was taking care of the naphthalene coming from the holder, and was clearing out the system. The kerosene heater employed is, however, much too small to give proper vaporization; and Mr. Haddock considers that it would pay to instal a small compressor, so as to permit the use of compressed gas—atomizing the kerosene in the form of a mist in the main in the opposite direction to the flow of the gas. He believes that this cold fog would act more efficiently than a hot one. If all the gas is washed completely, the only naphthalene to be found is that which is already in the system; but if only one gas is washed, or both only partly, it will be necessary to keep a very careful check on the naphthalene.

Ash in Coal.—Discussing a paper on "Coke as Blast-Furnace Fuel," which was read before the Newcastle Section of the Society of Chemical Industry, Mr. G. Weyman said that it was a matter of great difficulty to get uniform coal from the pit. In one case he had tested each wagon of a train of coal from one colliery; great care being taken in the sampling. The ash in individual wagons varied from 3 to 24 p.ct.; and the average of the whole trainload of fifteen wagons was about 10 p.ct.

INFORMAL MEETING OF SCOTTISH GAS MANAGERS.

ANNUAL MEETING IN GLASGOW.

The Thirty-Fifth Annual Meeting of Scottish Gas Managers was held last Wednesday, in the Hall of the Royal Philosophical Society of Glasgow.

Mr. J. W. Napier (Alloa), the Convener, in extending a welcome to the gathering, said they must recognize in these times and circumstances of war that the gas industry was one which had been considerably affected, particularly in the matter of economics, and as regarded the questions of coal supply and labour, which had been closely identified with the difficulties facing gas-works during the past year. What the future would hold for the industry, it was hard to say; but having regard to the determination of the country to maintain within its orbit its own industries, and to the conserving of our coal supply, it was certain that the processes of gas-works would undergo considerable change. He was not sure that there would not be Government Departments bringing pressure to bear on the works that were not being conducted economically—particularly in the matter of the use of coal. As to the disabilities under which certain companies had been labouring, that of dividend and the matter of the sliding-scale had affected not a few in Scotland.

Mr. Robert W. Cowie (Dalkeith) was then called upon to read the following address which he had prepared for the meeting.

Last year the President expressed the hope that his year of office would be that in which peace would be declared; but another year has come round, and still we find no signs of an early termination of this ghastly war. Were it not that we feel we are fighting in a righteous cause, one might be pardoned for being pessimistic; but—

> "Right is Right, since God is God,
> And Right the day must win;
> To doubt would be disloyalty;
> To falter would be sin."

There is no other alternative, therefore, but to persevere to the end, when righteousness, justice, and equity will, we trust, be the guiding principles of the nations.

A year ago we had a most encouraging address, in which was reviewed the position of the gas industry in the light of war conditions; and to-day I propose to give a sequel to that address by trying to visualize some after-war problems, instead of treating some purely technical questions of works' operations and results.

IMPORTANCE OF THE INDUSTRY.

The exigencies of war have brought into prominence the great value of the gas industry to the State, and have shown in a clearer light the true economy of its methods; and it is to be hoped that in future legislation, in times of peace, due regard will be had to the essential part played in providing munitions of all kinds quickly and efficiently.

The outlook for everyone in all stations of life has been completely altered; and as gas engineers we can never expect to see a return to the same conditions of gas manufacture, distribution, and administration as prevailed up to 1914. I venture to suggest that we have learned more than we know we have; and only the changed circumstances of the after-war problems will show us what we have learned.

Some gas undertakings urgently requiring extensions have been prevented from carrying them out by the direct prohibition of the Treasury; while more have been hindered by the fact that both money and material are scarce and dear. The latter conditions are likely to continue to obtain for some time after the conclusion of hostilities; and it will be for the engineer to carefully consider and decide whether new works, at present costs, or alterations on existing plant, with a higher efficiency and other methods, should be adopted. Should even a partial return to the low prices charged in pre-war days be expected, every source of economy must be tapped, every cause of waste stopped, and every ounce of efficiency obtained from every department. The gas industry has in the past weathered all storms; and though the present one is of long duration, and of the utmost severity, there is no doubt these testing times have only proved its strength and stability.

The imperative necessity for munitions in the early days of the war called forth the injunction to scrub the gas by what was called the "C" process, to increase the toluol and benzol content of the tar. This has been followed by the better and more efficient method of stripping the gas by means of a wash-oil. Here, again, by this new departure, we have a new standard of gas supplied; and in the many places where this method of stripping the gas has been in operation, there is no desire to return to the former conditions of supplying a rich gas, in which it is more difficult to obtain complete combustion, and to get the maximum of efficiency. Are gas undertakings to go back to the old wasteful ways, or continue along the avenue of progress so quickly opened-up by war conditions? The former is unthinkable; the latter is imperative. Close investigation should be made to determine the most economical standard quality of gas which should be made and distributed. There is much need here for research; and that there is room for such definition there is little doubt.

SINFULNESS OF WASTE.

One of the lessons taught by recent experiences is the great sinfulness of waste; and in the future more will be heard of the prime necessity of conserving our coal supplies in the country. The day will come (and it may come sooner than many expect) when it will be almost a crime to burn bituminous coal in an open grate, and when gas-fires will be universal. Before such an ideal condition can be arrived at, as gas engineers we must put more thought and investigation into the problem of procuring a fuel after the form of coke, where solid fuel is required, but lacking the disadvantages of coke. In every gas-works there might be a section of the works devoted to the production of this commodity of coke, coalite, smokeless fuel, or whatever it may be called; and the gas obtained would be the bye-product of this section.

It is evident that gas coke, as we sell it, is not a suitable fuel for domestic use, or there would not be the immense stocks in various parts of the country which we see to-day. The recent inquiry by the Coal Controller points to the certainty that he will insist on coke being used in steam-boilers, &c., in towns where there are large stocks, and prevent coal being brought in, and so further his policy in the saving of railway transit. This is only proper and reasonable, and will be welcomed by gas-works having stocks.

MARKET PRICE OF BYE-PRODUCTS.

Cannel coal seems in these latter days to have been re-discovered—at least, its value for the production of light oils. In a certain works in our district where a large proportion of cannel coal is carbonized, the results obtained with oil-washing are most remarkable; and even the crude, untreated tars are richer in benzol and toluol than many treated tars. There is a strong feeling abroad that, at the present time, and, indeed, for many years past, gas-works are not getting from the distillers a sufficiently good price for raw tar. In selling tar, where the sliding-scale has been operative—whereby the price is determined from month to month, according to a predetermined basis price, and effect is given to the varying market price of the products—the method is a fair one, provided, of course, that the basis price is satisfactory. To introduce tar-distillation plant of this kind into gas-works is a commonsense and practical proposition; but to make it a success will depend largely on capital cost, and whether the quantity of tar produced is sufficient in amount. The experience of gas-works' practice in the working-up of ammoniacal liquor is an example in point; and tar is in a similar position.

It may not be desirable to erect a number of single plants at each gas-works all over the country, and thus have a multiplication of unnecessary capital expenditure. This would be possible only in the larger works, and would leave the smaller works at a disadvantage. One good result, of course, would be that tar for road-making would find a local market, and therefore the best price; while there would be the saving of double railway journey—viz., transit to the distiller's works and prepared tar to be returned. The suggestion to erect works on co-operative lines at different centres has been frequently discussed in an informal way; but so far it has not got beyond this stage. The same objection to multiplying capital expenditure also applies.

I have the impression that the best arrangement would be for the managers of gas-works to meet in conference with the tar distillers and endeavour to come to a working arrangement as to prices. The distillers have already expended capital; and their works are equipped with existing plant. I feel that something could be done in the direction of bargaining with the distillers on better lines than at present. This would be infinitely better than unit plant at separate works; and there is no reason why there should not be a combine on the part of gas undertakings and tar distillers to each other's mutual advantage. I hope we may have a full expression of opinion from those who have erected such plant at their works.

It has been a matter of surprise to me that so much first-class cannel should be allowed to be sold daily in a particular community when the demand is for more light oils. Quite recently one of our consumers came to me and asked if I would exchange some coal with him. He had ordered a ton of house coal, and out of it he picked 10 cwt. of first-class cannel, and this he brought to the gas-works and had in exchange an equal weight of jewel coal from the whole-seam stock.

SUPPLY OF COAL.

I am pleased to be able to say that in my particular district we have had no trouble with regard to quality of coal supplied, nor the delivery, during the whole winter. We are fortunate in being near to the collieries; and in Dalkeith we deal direct with the coal companies. I believe, however, there are many here to-day who have not been so fortunate, by reason of distance from the coal-fields and the area from which they must draw their supplies, and could say strong things concerning the supply and quality of coal received during the past winter. In some cases, making gas from

such coal was about as great a difficulty as the Ancient Hebrews found in making "bricks without straw."

The regulations of the Coal Controller as regards supplies of coal to gas-works have met with strong criticism and considerable complaint, which in many instances has been quite well-founded. Speaking on behalf of gas-works, which are the source of production of valuable bye-products, and which provide not only the general public but industrial works with a supply of gas so important and so necessary, it does appear that insufficient knowledge had been displayed in making the allocations. A simple geographical line distinguishing the areas seems to have been followed, and in many instances disregard has been shown to the simple fact that gas-works' processes are of a particular technical character, demanding coals of a particular class. This observation applies more especially to Area No. 19, north of the Forth, whose source of supply is Fife. It is now known (though perhaps not admitted by those responsible) that, in confining gas-works north of the Forth to Fife coal, technical expert knowledge was not consulted in the first instanoe. The inevitable result was that a serious and upsetting situation arose in many works, particularly small ones. The chief points of complaint were: (1) The low gas-yielding and residuals value of the coals; (2) the coal generally did not give a coke suitable for the producer for heating the retorts; (3) the large amount of smalls and stones, as the result of inefficient handling at the pits. I am informed that the Coal Controller is not prepared to consider cases where no serious practical difficulties of working have arisen; neither will he listen to complaints regarding financial losses resulting from the use of poor quality coal. This aspect of the situation is a serious one, and will continue to be so for many gas-works—especially those where retort power is at a minimum, and where labour is difficult to obtain.

It is satisfactory to know that certain supplies of whole-seam and cannel are being allowed to go from the Lothians and Lanarkshire to our much harassed and worried brethren north of the Forth. With regard to the serious complaint as to the excess of stones and foreign matter in the coal, due to bad handling at the pits, if the District Coal and Coke Committee would take this matter up firmly with the coal-masters, it would help greatly to lessen the anxiety and worry caused by the allocation of strange coals. If the District Committee do this, and assure managers that as far as possible this complaint will be attended to, then the gas industry will be willing to put up with other difficulties and support the Coal Controller in his scheme of economy in railway transit.

LABOUR.

Not only has the gas industry supplied in large measure munitions and money, but the best of men have also been given; and there must be few gas engineers who have not felt the want of capable men during the past winter. The end of the war will not, however, end the problems of labour; though, of course, the scarcity will not be so great. Trades unionism has grown rapidly during the war, and has entered largely into the ranks of the various gas-workers, where before it was unknown. So long as workmen realize that they are dependent on the employer as much as the employer is dependent on them, there is then little to fear. Both are dependent on the other for success; and satisfactory results can only be obtained when both work harmoniously together. Both sides have their rights as well as their responsibilities; and a fuller realization of these is essential. If trouble is to be avoided, every injustice must be removed; and conditions of employment should be made as pleasant as the nature of the work will allow. One of the chief problems after the war will without doubt be that of labour, and many palliatives will be tried to smooth over the difficulties. It is probable, however, that the best solvent for this problem will be that of education.

EDUCATION NECESSARY.

The question of education is exercising the minds of many—especially in Scotland—at the present time; and though Scotland has ever been in the van of educational progress, the proposed reforms will no doubt be a real step forward. Under the present system, many young people are crammed with subjects which have absolutely no bearing on the youths' after life, and are soon forgotten and pushed out of mind by reason of neglect of opportunity to put them into practice of useful work. It is satisfactory to know that the new system will in a measure remove this objection, as young people will be kept longer at school; and after having left school and started work, attendance at Continuation Classes will be compulsory. Every employer of labour must then afford to every young person in his employment any facility found necessary to attend these Continuation Classes. A noteworthy feature of these classes is that they will be held at some suitable hour during the day, when the mental faculties are active and alert, and not during the evening, when the student is thoroughly tired out with a heavy day's work. Not only instruction in the English language and literature and other parts of a general education will be given; but special instruction conducive to the efficiency of the young persons in the employment in which they are or are likely to be engaged, will be provided. The budding engineer or gas-fitter will learn workshop arithmetic; and seeing the relation that it will bear to his workshop practice, it will cease to be an irksome mental exercise, and become a fascinating branch of his work, which will then appear to him more a science than a toil to earn his daily bread. The other subjects of geometry and drawing, practical work and experiments showing definite principles, all lend added interest. This scheme is bound to have, in course of time, an invigorating effect on the intelligence of ordinary workmen employed in all technical industries. During these recent times certain workmen have shown a considerable amount of selfishness and an inability to look at the difficulties of others from any but their own viewpoint. With such men it is not so easy to deal. If workmen only understood better the duties and responsibilities of true citizenship the relative values of capital and labour, with their interdependence, and with a like understanding on the part of employers, there would be much less trouble and friction, and fewer threats of strikes or locks-out. If there is one subject more than another which should be made perfectly clear not only to the British workman, but to every British citizen (employer and workman alike), it is the absolute necessity for hard work and strict economy for years to come. Only by such means can the wealth which has been and is being lost to the nation through the extravagance of war be made good. If this essential fact is not realized, and workmen think that after the war is over the good times enjoyed by the munition workers will continue, then there is a rude awakening for them. All branches of trade and industry in the country are so linked-up and interdependent that this applies equally to the gas worker and to the coal or steel worker. With the educational purpose in view, well-written articles on similar and social subjects from time to time appear in the public Press, and without doubt will in time bear fruit.

FUTURE OF THE INDUSTRY.

With more immediate reference to the gas industry, if the future is to be an unbroken record of advancement, the question of educating the public must ever be kept in view. It is not sufficient to educate the gas-fitter to fix properly a gas lighting, heating, or cooking apparatus, but the public must be educated to the proper use of all such appliances, and made to realize by their success that they cannot do without them. There are misconceptions to remove, and prejudices to dissipate; and in their place there must be planted facts and ideas which will make the public more than ever dependent upon gas for light, heat, and power. Our electrical friends have not been idle regarding this matter during the war. There is no "Party Truce" in this matter; and the gas industry must not allow this most important of all problems to be relegated to a back seat, or it may find itself occupying the same.

SCOTTISH GAS COUNCIL.

A year ago to-day, considerable discussion centred round the fact that Scottish gas managers were inadequately represented on the Council of the Institution of Gas Engineers and on the National Gas Council. Since that time events have been moving rapidly; and (chiefly due to the foresight, energy, and tact of our worthy Convener) a Scottish Gas Council has now been formed. This Council, we all hope, will deal effectually with the various problems arising out of influences and conditions brought about by the war. The various Gas Managers' Associations are purely technical, and have done, and will continue to do, immense service to the gas industry by the discussion and dissemination of technical subjects. We can all testify to the fact that the various gas undertakings we represent have greatly benefited through these Associations. There are questions of policy, administration, and legislation, however, which cannot be so well dealt with by these Associations; and it is just here where the Gas Council will be of the greatest service. Being thoroughly representative of municipal and company undertakings, both administrative and engineering, and as it always embraces two representatives from the four largest cities in Scotland, the efficiency of the Council should be of a high order. The inclusion in the membership of the Council of conveners and directors provides for them not only a direct interest in gas affairs in their wider aspect, but also secures the influence and authority of corporations and companies; and this must surely be for the benefit of the gas industry at large. It need hardly be pointed out that the system of Gas Associations in the past, with a membership drawn from the technical side only, is somewhat out-of-date with regard to problems to be met and questions that arise from time to time affecting gas undertakings as sources of financial investment and the supply of gas for public use. The serious position in which the various gas undertakings in the North-East of Scotland found themselves after the issue of the Coal Controller's orders regarding the conservation of transport, would have been immediately taken up by the Council, and pressure brought to bear on the proper quarters. The question of financial hardships of statutory gas undertakings, and also the question of workmen's wages, with many others, all wait immediate attention.

IN CONCLUSION.

I have endeavoured to take your thoughts away from the gas-works, and by way of a change view some of these problems. There is sure to be a great diversity of opinion on many points; and I trust the discussion will bring out these more fully.

DISCUSSION.

Mr. NAPIER, in opening the discussion, referred to Mr. Cowie's remarks on education. Undoubtedly, he said, so far as the gas profession was concerned, looking back only one decade, some remarkable progress had been made. Some fears had been brought forward from time to time that the status of their profession was not what it ought to be; and intimation had been made in certain quarters that something should be done to preserve the rights of the individual, having regard to the professional position he occupied. He was not sure that such an Association would gain much sympathy out with the profes-

sion, and among those to whom they were responsible. He was a strong believer in the value and power of the individual being such as to preserve for him the position which would safeguard him in all circumstances. If they looked to the progress that had been made in their profession, they would recognize the tendency for the younger generation to come more and more from out the portals of the universities. Undoubtedly, the position of the gas engineer to-day was not merely one of practical significance; he must needs have an education, scientific and also classical. It was, perhaps, one of the happiest features for the welfare of the industry in the future that the men coming forward were men who had gone through special training, and had specilized in particular departments. Hardly any industry to-day could be said to be doing its work well unless it had its specialists. The gas industry had its specialists. They ought to welcome men of this type of mind, because they would add considerably to the position that gas was bound to occupy in the future. He was interested recently in reading an interim report of the Coal Conservation Sub-Committee, which dealt more particularly with the electric power supply in Great Britain. He had no difficulty in foreseeing that there were going to be great changes in connection with the gas industry. If there were going to be economies in the use of coal—and he believed the Government would insist upon them—then, scanning the horizon, he could see that the gas-works were going to be the key-industry of the supply of fuel to a great variety of industries. Looking up the report that he had referred to, they would see the recommendations as to the design of plant, where bye-products plant could be combined with power plant. Bearing in mind the fact that public works still burned coal to destruction, it was not difficult to see that gaseous fuel would play an important industrial rôle in the future. If the resources of our country were to be properly conserved, then it seemed to him that carbonization of coal, recovery of bye-products, and the production of gas in greater volume than by the present methods, were the lines likely to be followed. As an outcome, the quality of the gas would be less, because, in order to arrive at the utmost result in carbonization, it was necessary they should obtain a larger quantity of gas from the carbon content of the coal. Evidence of this was seen in recent practice with vertical retort installations. The gas-works of to-day which were equipped with vertical retorts were undoubtedly in a strong position in regard to costs and labour troubles. If they considered for a moment that changes came about in cycles, he thought at the present time they were approaching a stage when the coal carbonized in gas-works would be carried out so as to obtain large volumes of gas. It might be of low heating value; but, as an economical process, it was necessary that these lines should be followed. The gas would be used, not only for domestic purposes, but also in the larger industries, where boiler power was needed. The authorities, he was sure, would insist upon bye-products works being put alongside works that required power, in order that the coal used might be carbonized in a scientific and up-to-date way. They ought as an industry to take credit for a considerable advance in the conservation of coal. If they compared the results of a few years ago with horizontal retorts with those of to-day, the advance was marked—from 12,000 to 16,000 c.ft. per ton, which at a moderate estimate was equivalent to a saving in fuel of 30 p.ct. Again, they had had a considerable increase in the amount of bye-products, in some instances equal to doubling the quantity of ammonia yielded. Data of this kind should be credited to the industry as evidence that they had progressed, and were willing to progress. It was, perhaps, unfortunate that capital expenditure entered so largely as a deterrent, preventing the introduction of up-to-date plant. As regarded the question of coal supply, to which Mr. Cowie referred in definite terms—and, he (Mr. Napier) thought, with good reason for complaint—he would like to say that, from his own experience of the District Coal and Coke Supplies Committee and the Chairman (Mr. Nimmo), they were sympathetic as to the needs of gas-works, more particularly north of the Forth. At a meeting he had had with them last week, Mr. Nimmo had been particularly emphatic on the necessity of the coal supplies being properly cleaned, and had given definite instructions that care was to be exercised by the coal companies in this direction. He (Mr. Napier) had emphasized that if the foreign matter were removed, and care taken by the coal companies, this would go a long way in meeting the difficulties of gas manufacturers.

Mr. J. Ballantyne (Hamilton) said there were great developments ahead. He thought they were all agreed that there was no possibility of going back to the old pre-war conditions—such as 16 or even 14 candle gas. These were things of the past. It was going to be a question of gaseous fuel in the future. He was not sure that there would be any great advantage to be derived in producing fuel such as coalite, as suggested by Mr. Cowie. There would still be a certain amount of waste. He understood that, to be successful, 10 p.ct. of volatile products had to be retained; and this meant 10 p.ct. of the volatile products of the coal being wasted. The proposal was not feasible. He thought it should be their endeavour to take everything out of the coal that they could get, and to impress upon the consumer that, instead of having solid fuel, he should get it in the gaseous form, which was the ideal way of using fuel. Coal was the heart-blood of the nation. The country's mistake was the great amount it had exported to other nations. If they were to go on doing this, they would be committing national suicide. The moment Great Britain had to import her coal from abroad, she was a lost nation. This should be kept before the minds of everyone. It should be a criminal act to export much more coal out of Great Britain. While making the most of the country's coal, and while obtaining from it as much as possible in the way of tar, oil, and ammonia products, it was necessary to get the consumers educated up to the proper way of using gaseous fuel. With regard to the question of tar, he was not sure whether good would come out of bargaining with the distillers. They had understood that tar distillers were honourable men. They were supposed to give good returns; but many gas engineers had now different views on the matter. As to a co-operative system of tar distillation, corporations first would require to obtain special parliamentary powers; but large works putting-up installations of their own would be no benefit to the smaller works. Education was a very important point; but they should guard against going to the opposite extreme. He did not think education should be confined to the particular line of life one was going to follow. It was not possible for anyone to know too much; and though knowledge might not be directly applicable, it was an indirect aid. If they went to the opposite extreme, and trained their apprentices and young people solely in the particular line in which their lives were set, injury would be done. Much might be said of the future of the industry in connection with the education of the public. Much more might be done by local lectures and demonstrations, and especially by having trained representatives going to the houses of consumers and demonstrating the advantages of gaseous fuel. They should have trained staffs suitable for such demonstrations.

Mr. William Wilson (Falkirk) remarked that, on the subject of their relationship with the tar distillers, Mr. Ballantyne was in a doubting mood. He (Mr. Wilson) had sent round a "Fiery Cross." The whole of the gas industry of Scotland was united in making an attempt to get a decent price for tar. It was out of place to show all his cards at a public meeting; but for the benefit of Mr. Cowie, he would say that his suggestion had already materialized. The Commercial Section (Western District), at their last meeting, sent a request to the Scottish Gas Council to take up the matter, and with the approval of the various engineers furnish him with information. He was quite prepared to put all his data in the hands of the Scottish Gas Council. He had seen the Ministry of Munitions, who had issued Orders regulating the disposal of tar. The Ministry of Munitions were very sympathetic over the question. It was a State issue. The tar distillers were controlled; they had nothing to gain. The gas engineers should make their demands, and see that they got them. They should make them in a friendly spirit first of all. The matter was urgent, because 90 p.ct. of the undertakings in Scotland fixed new contracts between May and July; so that their contracting parties were synchronized. The larger undertakings—Glasgow, Aberdeen, and, he thought, Dundee—sold their tar on the basis of a sliding-scale. Those in charge of these undertakings were sympathetic to the smaller works. Mr. Wilson then read a type-written slip, supposed to be composed by tar distillers, of which the concluding sentence was: "The only reason we are staying in business is to see what will happen next."

Mr. David Vass (Perth) remarked that he was reminded of the expression of a friend in the gas-stove trade, who said the day was coming when there would be only one smoking chimney in the town—that of the gas-works. He replied that this was a mistake; and the friend agreed that the gas-works chimney would also be a smokeless one. He thought the ideal would soon be that raw coal would only go into the gas-works, and nothing would be left but gas and ash. There was no reason why all the carbon should not be converted into gas, and sent out in gaseous form. They would not stop at 20,000 c.ft. to the ton. He had distilled tar for some years, and had made some profit; but the extent of the profit had to be gauged. In a gas-works, they did not put anything down for rent of the ground or taxes on the tar portion of the plant. This would have to be deducted to put the tar-works on a separate basis. It was when one came to deal with the more profitable products of the tar that profits mounted up; and this was where the tar distillers' point of view came in. If they went in for the trade, and only made one or two products, they did not get the high yield out of the ton of tar that was possible. This had to be kept in view, in the case of setting-down a separate works. There was, of course, a profit; and at Perth they found it better to run a tar-works than to sell. They must remember that there was very little saving in transport, unless what one made was used on roads. It was different with sulphate of ammonia, where one used 20 cwt. of material, and out of this only extracted 1¼ cwt.—one ran the liquid down a drain, and saved transport. In the case of tar, there was no running of waste—nothing to dispose of. A conference with the tar distillers would be all to the good. As for coal supplies, those of them in No. 19 District (Fife area) had been badly hit in the nature of the material available. Many were struggling away with what they could get; and it meant a financial loss to some extent. If this were all, they would grin and bear it; but when one had a breakdown of machinery and a stoppage of the gas supply through not having sufficient retorts, it was a serious matter. Evidently the Coal Controller said: "We will do nothing until you are in that position." In his own case, they gave him about 2 p.ct. of coal outside No. 19 Area, when he was nearly "in a hole." This 2 p.ct. was not better than the nuts they were getting in their own district; but they required it, and this was the relief they got. They had been working on pre-allocation stocks, and had made a big inroad. There was not a workable material for their purpose. They had appealed; and he believed the appeal was to have a favourable hearing from the Coal Controller. They had found the Department very difficult to move. If the Gas Council could assist them in this matter, they would be greatly indebted. There was one reproach they must remove—the attitude of the gas committees who did not see that it paid to advertise and to educate gas consumers. There were some who thought if they spent money in this way it was being thrown away, and that inspectors only meant wasted money. A thorough canvass and the education of the consumers were very much needed.

Mr. T. Wilson (late of Coatbridge) thought they had almost reached perfection in the production of gas with their modern plant; but something still required to be done in regard to bye-products. They did not get half of what they were worth. He hoped things would never go back to the low stage they reached before the war.

Mr. Lawrence Hislop (Uddingston) said from his personal knowledge of what was likely to transpire in the near future, he thought they would see lower prices for gas than they had ever had—owing to new methods, the progress made, and to the assistance given by the Government to the industry. If they went on with such progress, he thought they would see more gas sold under 1s. per 1000 c.ft. than over it. Of course, it might take a year or two. Mr. Cowie had spoken of the quality of the gas now supplied. For the past year at least, they had been sending out in Uddingston a gas that had practically no illuminating power; but, at the same time, it had a good heating power. When he told them that this gas could be made and delivered to the holders at a profit, instead of being a cost—it could be delivered at less than nothing—he thought it showed a tendency of the future. He would like to mention the name of the man to whom all credit was due—the late William Young. The experiments they

carried out at Uddingston were all due to his going back to the papers Mr. Young read before the West of Scotland Association, which, he believed, was the originator of these Informal Meetings. In his early papers (1882 and 1883), Mr. Young said that in the near future gas would be a bye-product; that, if special attention were paid to the residuals, they could produce such a revenue that the gas would then be the bye-product. Though it had taken 35 to 40 years for this idea to bear fruit, it was doing so to-day. He would like to say, regarding labour, that there were a great number of them suffering through their harsh treatment of the men in the past. In the old days, it was customary to order the men about. In some works he had visited, the men were treated like dogs; and in these works the managers were now suffering more than in places where the men had been treated decently. Since the war started, he had never been asked for a rise in wages; and the men were paid as well as elsewhere. When one found that three men in three shifts could make something like a million c.ft. of gas in 24 hours, it showed their command on labour. One great difficulty just now was certainly the obtaining of washed fuel, and of supplies of small coal. There were a great many gas-works in Scotland which had breakers. Those that had breakers could relieve the situation by taking in large coal and breaking it, so favouring other works which were only fitted for small coal. He believed something was to be done with this object by the Coal Controller.

Mr. DAVID FULTON (Helensburgh) remarked that the President had referred to the quality of the gas of the future. He thought that Mr. Cranfield in 1915 indicated what, to his mind, would be the gas of the future.* The first consideration was purity—freedom from sulphur. The second was to have as nearly as possible a constant air ratio—to have conditions in which the number of volumes of air to one volume of gas were as low as practicable, so as to develop as high a flame temperature as possible. Mr. Cranfield spoke also of getting from the carbon-content of the coal all the gas they could. He brought out strongly that the gas should be supplied as free from incombustible matter as it could be. Mr. Fulton continued that he did not think it was right to send to the consumer a high percentage of incombustible matter. They could keep it down, and give him gas at a low cost. If they were to have a gas used solely as fuel, they would need to have their gas-fires reconstructed. As they were at present made, it was too easy to waste gas. The same fire properly used would consume 3 c.ft. for every 7 c.ft. consumed if it were not properly used. Coming to education, Mr. Cowie had a wrong idea of what education meant. Education, to his mind, did not consist of turning-out good plumbers and good joiners. It should teach the people to think; and it was in this respect that the education of the past had been a failure. Mr. Ballantyne thought that it should be made a crime to export coal; but the whole system of commerce was bound-up with exchange. If they did not export coal, what were they going to barter with?

Mr. JOHN RICHMOND (Penicuik) remarked that Mr. Cowie had stated that they required a new form of coke. He, however, did not think it at all necessary to have anything added to or detracted from the average run of coke. In one district of which he had experience, coke was used in open grates by rich and poor alike. It was consumed as a domestic fuel, with satisfactory results. There was no necessity for deviating from the process of leaving a solid residue of coke. They saw boilers getting greater efficiency in using coke than where coal was formerly employed. He believed there would be no possibility of coming to terms with the tar distillers, unless they had some weapon to hold over their heads in the shape of the idea of co-operation in tar distillation. In regard to labour, they wanted less of trades unionism to think for the men; they wanted the men to think for themselves, and to see that capital and labour were mutually interdependent. He also held that they must not deceive the public, and give them anything in the shape of inert gas—charging them for useless gases. He looked back with pride on the better quality of gas supplied a few years ago. If they were going to reduce the quality, they must at the same time reduce the price.

Mr. W. M. MASON (Secretary of the British Commercial Gas Association) was sure that when the work of coal control got into regular practice it would operate efficiently. He agreed with the last speaker on the subject of coke. Too often gas engineers and companies did not use commercial methods in dealing with coke. They made no attempt to develop a local market. The result was that, when trouble came, they were flooded out with coke. There was certainly need for co-operation with regard to tar; but it was also necessary in the matters of coke, education, and the industry as a whole.

Mr. JAMES DICKSON (Johnstone) said there were three methods before them at present for making gas: (1) Low-temperature carbonization, with the addition of air at the works; (2) high-temperature carbonization, with an admixture of blue water gas; and (3) vertical-retort gas, with continuous steam. He was out for the last—having the vertical retort and the steam-boilers at hand. The volume of gas could be increased to what would formerly have been considered as unheard-of figures. He was of opinion that the tar distiller would not pay a penny more than they could force out of him. It was only by united effort that they could hope to get the true value realized out of the tar.

Mr. COWIE replied briefly to the discussion.

The meeting terminated with the election of Mr. James Dickson (Johnstone) as President for the next year.

* The lecture here referred to appeared in the "JOURNAL," Vol. CXXX., p. 139.

Society of British Gas Industries.—The programme has now been issued of the annual general meeting, whice will take place at the Trocadero Restaurant on Thursday, the 18th inst. At three o'clock there will be the general business meeting, and at four o'clock (for which hour visitors are invited) the President, Sir Robert Hadfield, Bart.. F.R.S., will deliver an address. The induction of the new President, the Right Hon. Lord Moulton, G.B.E., F.R.S., will be at 4.45; and this will be followed by afternoon tea.

MANCHESTER JUNIOR GAS ASSOCIATION.

Annual General Meeting at Manchester.

The Eighteenth Annual Meeting of the Association was held on Saturday, at the Grosvenor Hotel, Manchester, under the Presidency of Mr. W. BUCKLEY, of the Droylsden Gas-Works, Manchester. There was a large attendance, including several members of the Senior and kindred Associations.

ANNUAL REPORT AND ACCOUNTS.

The HON. SECRETARY (Mr. James Bridge, of Stretford) read the annual report of the Council which stated that the membership is now 175. As far as can be ascertained, 28 members are serving with His Majesty's forces; being 15 p.ct. of the total membership. Mr. W. C. Roberts, of Liverpool, has been killed on Active Service. The Joint Council Meeting of English Junior Gas Associations was held in Birmingham on May 19. The chief item on the *agenda* was consideration of suggestions made by Mr. S. Tagg at the last annual meeting regarding the collection of some definite data; and after a prolonged discussion, it was decided to ask each Association to submit a table on work in the retort-house. But the Council considered the subject to be too comprehensive to be practicable, and accordingly compiled a list of questions relative to the construction and heating of retort-settings. Mr. Hollingworth's offer of three guineas was accepted to form the nucleus for the award of a diploma for the best paper appearing in the "Transactions;" and it was also resolved that each Association give an annual contribution of 10s. 6d. to perpetuate the fund, and that the Institution of Gas Engineers be asked to adjudicate and award the diploma at the Institution meeting. The Council regret that there has not been any competition for the prize offered by Mr. Franklin Thorp. The prize offered by Mr. Fairhurst, of Altrincham, for the best paper read before the Association on a subject relating to the manufacture of gas has been awarded to Mr. William Fletcher, of Liverpool, for his paper on "Naphthalene" read before the Association at Ormskirk last February. Owing to the fact that there was only one competitor for the prize offered by Mr. Garlick, the award will be carried forward to next session; and Mr. Thornley's paper will be considered along with the papers then read.

Mr. C. E. TEASDALE (Salford) proposed the adoption of the report. He asked them to be upstanding as a mark of their sympathy with the relatives of the late Mr. W. C. Roberts; and he moved that a vote of condolence be forwarded to them.

Mr. W. L. HEALD (Preston) seconded, and the motion was carried in silence.

Mr. J. ROBINSON (Altrincham), the Hon. Treasurer, submitted the annual balance-sheet, which showed a balance carried forward to 1918-19 of £7 11s. 7d., as against £18 12s. 6d.

The PRESIDENT said it was rather unfortunate that they had less money in hand at the end, as compared with the beginning, of the year. A large proportion of it was due to the extra cost of printing. The Council had decided that the subscription should be raised from 5s. to 6s. per annum, and the "Transactions" in future be supplied to members at two-thirds the actual cost, instead of at 2s. 6d.—the balance coming out of the Association funds. The Senior Association, he added, extended to them the privilege of purchasing their "Transactions" at 2s. 6d. a copy, the same price as charged to the members; and they had now raised the price to 7s. 6d. Members of the Junior Association would still be able to purchase the "Transactions" of the Senior Association, if they wished to do so.

On the motion of Mr. W. HILL (Stalybridge), seconded by Mr. A. L. HODGSON (Salford), the balance-sheet was adopted; and the meeting approved the suggested increase in subscription.

OFFICE-BEARERS.

The PRESIDENT announced that the result of the ballot showed that Mr. W. Fletcher (Liverpool) had been elected Junior Vice-President for 1918-19; Mr. F. H. Goodwin (Salford) having withdrawn.

The PRESIDENT said that, as there were no nominations other than Mr. James Bridge (Stretford) and Mr. J. Robinson (Altrincham) for the positions of Hon. Secretary and Hon. Treasurer respectively, these gentlemen were elected. The ballot for Auditor proved to be in favour of Mr. Isaac H. Massey (Oldham).

PRESENTATION TO MR. BRIDGE.

The PRESIDENT said he had now to perform a very pleasing duty As many of them were aware, Mr. Bridge had recently married; and the members wished to give him some slight token of the esteem in which they held him. They had known Mr. Bridge a long time, and very highly appreciated his services. He was sure he was voicing the feelings of members when he said they wished Mr. and Mrs. Bridge long life and happiness. He asked Mr. Bridge to accept, on behalf of his wife and himself, a pair of silver tazzas, the inscription on which read:

> Presented to James Bridge, Esq., by the members of the Manchester Junior Gas Association, as a token of their esteem on the occasion of his marriage.
> September, 1917.

Mr. BRIDGE thanked them most sincerely for the handsome present, and for the good wishes and the congratulations. It would always be a pleasure to look upon their handsome gifts, and to remember the donors. After April 23 his address would be the Gas-Works, Lum Street, Bolton, where he hoped to take up duties under his new chief, Mr. W. J. Smith.

ELECTION OF COUNCIL.

Messrs. F. W. J. Belton (Macclesfield), S. Carter (Liverpool), E. Hardiker (Bolton), and W. L. Heald (Preston) were elected members of the Council; the last three being retiring members and eligible for re-election. Mr. Belton takes the place of Mr. Fletcher (Liverpool).

Mr. J. B. STEWART (Rochdale) proposed a hearty vote of thanks to the Council, to whom fell the credit of arranging such a splendid programme of visits and meetings during 1917-18.

Investigation of Retort-Settings.

Mr. F. W. J. Belton (Macclesfield), seconding, said the Council had been very energetic, and had spent much time in the preparation of the questions relating to the construction and working of retort-settings. He suggested that the Council should extend the time for answering over the summer months. Great pains had been gone to by many of them to get out results; and if they worked systematically together, they would secure a great deal of information which would be of inestimable value to the members generally. [At the evening meeting, this question came up for discussion; and it was decided to extend the time of completing the investigations to Oct. 1. The Hon. Secretary was instructed to communicate this decision to all who had intimated their intention of taking part in the investigations.]

Mr. A. L. Holton (Manchester) acknowledged the vote.

Mr. Fletcher's Honour.

The President announced that the prize, value two guineas, presented by Mr. T. Fairhurst for a paper relating to gas manufacture had been awarded to Mr. Fletcher (Liverpool); the Council considering that his paper was the most useful to the general members. It was never, however, an easy matter to determine who should be awarded a prize. He asked Mr. Carter to accept the prize (which took the form of four technical books) on behalf of his colleague.

Mr. Carter, acknowledging the prize on Mr. Fletcher's behalf, said his paper was a very apt one at the present time. He was sorry to say Mr. Fletcher was suffering from bronchitis, and was threatened with pneumonia.

Mr. Teasdale said it would not be right to let the occasion pass without referring to or recognizing the hard work done for the Association by Mr. Holton, who had spent much time and energy on Association business. Mr. Holton had occupied the office of Hon. Secretary of the Joint Council of English Junior Gas Associations to such an efficient extent that the Joint Council were very loath to lose his services when he desired to sever his connection.

Mr. F. A. Collier (Oldham) seconded the motion, which was also supported by the President.

Mr. Holton said that, like their friend Mr. Bridge, he had been the recipient of a tangible token of their good wishes, but he valued the expressions of opinion that afternoon even more than when he received those tokens of appreciation.

The President extended a hearty welcome to Mr. W. W. Woodward (Salford), and said they were very pleased that he had come to hear Mr. Teasdale, his Chief Superintendent, deliver his Presidential Address.

The Retiring and New Presidents.

The President said the time had come for him to bring his term of office to a close; and he now had great pleasure in introducing his successor.

Mr. Teasdale having taken the chair, amid acclamation, said his first duty was to propose a vote of thanks to Mr. Buckley, who had done very well during his period of office.

Mr. W. L. Heald seconded; and Mr. Buckley having briefly returned thanks,

Mr. Teasdale delivered his

PRESIDENTIAL ADDRESS.

We, as the junior members of the gas engineering profession, must realize our position. The gas industry of the future is dependent upon our efforts; and therefore we must put our shoulder to the wheel. We are passing through a serious period. Let us face it more so in the future than we are doing even now. It is up to us to improve matters. The cry after the war will be for a suitable and cheap article. We must speed-up and supply this—encourage our customers to use our products increasingly, so as to take their place in the trade war which is bound to come, and so help them in our humble way to win.

Everyone will agree that the future requirement is a good, cheap gas, while at the same time producing the maximum amount of residual products. Therefore, labour costs must be low (say) by the aid of labour-saving machinery, as recently brought forward prominently by Mr. J. P. Leather, in his Presidential Address to the Manchester District Institution of Gas Engineers, or by some other means. It is up to the management to produce this. It does not follow that because we have done, or are doing, well in the particular undertaking in which we are engaged, that we cannot do better. The cry after the war will be improved efficiency, increased output, and to make the very most of labour, materials, and equipment. How are we to do this? That is the point which every engineer, manager, and his assistants (however humble they may be) must consider.

Scientific Management.

The two things regarded as essential are an increase in production and the avoidance of waste matter. Our main endeavour, then, must be to build up what I will call an "efficiency works"—not necessarily to Americanize our methods, but at least to systematize or introduce further "scientific management" to the gas industry. When I say "to the gas industry," I do not mean to gas manufactures alone, but to contractors to gas undertakings as well; for the latter, by systematizing or introducing higher industrial management, will bring his works to a higher state of efficiency, so helping his benefactor, the gas undertaking, in his bid for the ideal.

Industrial management is not a new subject, as you all know; and a great number of books are available in different forms. Although perhaps it is not possible to create an ideal system on a gas-works, it is at least possible to modify our methods considerably; and the matter of "systematizing," or the introducing of scientific management to our industry, is a hopeful one. Many of our members have no doubt commenced on these lines; while to others the subject is still holding out its hands. Any attempt at reform, or the disturbing of old habits, will be followed by complaints and murmurs of disapproval; but do not take any notice—"carry on." To the experts, I would humbly suggest that one may "live and learn," and that a reconsideration of our long-practiced methods as applied to a gas undertaking is necessary. Are they the most efficient for the maximum economical production? Scientific management is at the present time receiving very prominent notice in Government and other publications dealing with the future of industry. Also, special courses of lectures are now being delivered in the principal centres, on "industrial management," which probably will appeal to the many who have the gas industry at heart.

Scientific management means being well informed as to the best thing to do, the best way to do it, and the best rate at which to do it, and is based on a system that the whole routine of the works, to the last operation, is organized by the management. Thus confusion, overlapping, delay, and waste (both human and material) are avoided, and the course of the work is planned as smoothly, rapidly, and efficiently as possible; the right worker is put in the place to which he is most fitted; he is trained to produce the best results in the position; the haphazard placing of men is abandoned; and the best machinery, apparatus, and tools are adopted in as complete a manner as possible, with due regard to capital outlay and saving in wages.

The question of fatigue is studied very carefully, and overstrain is not permitted. Unnecessary movement and operation are eliminated, so that everything is arranged to give the least amount of exertion to the worker; and the result is that a shorter period is required for the effective performance of any particular work. The worker is encouraged and recompensed by a system of payment by results. Scientific management is a process which tends to fill up the gap caused by the antagonism between master and man. Organizations of employers and employees certainly produce the effect of combatants, each being made specially to fight the other. Scientific management has for its foundation the firm conviction that the interests of the two are one and the same; that prosperity for the employer cannot exist for a long term of years unless it is accompanied by prosperity for the employee, and *vice versâ*—that it is impossible to give the workman what he most requires (higher wages) and the employer what he wants (a low labour cost). The greatest prosperity for the workman, together with the greatest prosperity for the employer, can be brought about only when the work in the concern is done with the smallest human effort, *plus* Nature's resources, *plus* the cost for the use of capital in the shape of machines, buildings, &c. Now, this being correct, each individual of the works must be developed to the highest state of efficiency.

From this brief summary of its principles, it will be seen that scientific management is a means to an end. It will help us to build up our "efficiency works." It will increase the duties of the management, and require a larger staff for its manipulation. An extra clerk or two may be required; but what does it matter, if the saving in cost be so much greater? I wonder why managers so often "jib" at starting another clerk, when they think nothing of putting on an extra workman or two. If we apply some of these principles to our own particular case, we may be able to put new life into our work generally, and change the stagnant feeling which I am afraid exists in some districts to one of liveliness, and eventually turn out low-cost products and bigger dividends.

Study of Machinery.

Careful study of the working time of all classes of machinery may result in the saving of a great amount of wear and tear and labour costs, which, expressed in money, would very soon pay the manager's salary. For instance, what proportion of the 24 hours does the running on full load of coal elevators and conveying machinery bear to the time taken in running on part load, empty, or not running at all? You would probably be astonished if the "load hours" were carefully observed and compared with the total hours worked. How often are the elevators working with the buckets only one-quarter filled with coal? Ask yourself the reason of this. Is it the elevator that is running too quickly, or the feed of coal to the elevator too slow?

Coal elevators and conveyors are put in as a labour-saving device; but a great deal of money can be spent in repairs and renewals, due principally to neglect or want of foresight by the man in charge or by the management. If with the same elevator, and running at the same speed, you can lift more coal per hour, you will have made a little improvement. But carry on further. Educate your man in charge—and, in fact, all your employees—in their particular job, or part of a job. Talk to your worker personally, encourage him to make suggestions, listen attentively to what he has to say, be patient and tactful. A skilled or even a semi-skilled man with intelligence and capability to consider and modify his methods is necessary to the building up of an "efficiency works."

The Labour Side.—Co-partnership.

The worker of the future is a man who will have to be cultivated. At the present time, I wonder how many gas undertakings have not had labour troubles. Let the majority think for themselves. Labour of to-day is not of the pre-war type; therefore we must anticipate the labour of the future. Let us recognize we are coming to more democratic methods. The workman will have to have more consideration. It will probably be neces-

sary to consult him on any preconceived change in methods of human labour.

Let a works committee be introduced by those who have none, and let those who have make the most use of it. Bring things up for consideration that will interest all. Do not rely only on complaints between master and man for prime discussion. Something will most surely come out that will benefit all. The greatest bugbear with which we have to contend is the shirker. If a "live man" is put to work beside the "shirker," the former soon comes down to the speed of the latter. In the same way, if there are two shirkers in a gang of men, the gang goes at the rate of the slowest. The consequence is the efficiency of the whole gang is seriously diminished. It sometimes happens that gangs of men deliberately go-slow as a body, and refuse to do more than a self-predetermined amount of work—that is to say, only fill four wagons with coke, whereas five wagons should be filled in a given time. Certain classes of machines or machinery are made to do only a certain amount of work, whereas their working capacity is much greater; the men being under the impression that by working full load, they are doing another man out of a job, whereas the directly opposite is the effect. The more work turned out per man, the cheaper the cost of the operation, and ultimately the cheaper the finished article. Then, the cheaper the article, the greater the demand, and consequently the production. Hence more men are required.

PAYMENT BY RESULTS.

Payment by results is part of the scheme of scientific management, and should receive careful study by all, whatever method may be adopted. Co-partnership is a successful scheme applicable to gas workers, on the recently revised plan of the Gas Light and Coke Company [see "Gas Journal" for March 5, p. 437], which helps to fill up the breach between labour and capital. The workers share alike with capital the profits earned, being on the same basis as the owner. As stated in the Editorial, just referred to: "The labour problem is one of the greatest that lies before us. In the post-war reconstruction and in the expansion of home industries labour will have to take a large part."

It behoves us to recognize this in time, and to let the worker prosper with his employer, and so weld together the interest of both in the making and working of an "efficiency works." The slacker will have no mercy from his mates. He will have to do his fair share or get out. In works where co-partnership is in vogue, I understand not only will they not tolerate the slacker, but a change has come over the workers; the men are more steady, respectable, and thrifty. They have something in the bank that they have never had before, and shares in their own company. Is it not time for many more gas companies to effect this change? Are corporations and district councils hopeless?

STUDY AND PRACTICE.

The object of any good system must be to produce first-class men. I saw in the "Editorial Notes" of the "Gas Journal" for March 5, the question of shortage of first-class men for the gas industry is discussed, and there is a timely warning of our position. It is suggested that in the future it will be a case of grabbing the best men. After all, this has been done ever since I first joined the profession. The search of all industries for the ready-made competent man still exists, and will continue to exist. It is by co-operation in systematic education that we may hope to level things up. Mr. Leather has struck the right note in his Presidential Address, when he states that "scientific study should run concurrently with experience in practical work." Many engineering works are now working their apprentices one day or two days at the works in a practical way, and the next two or three days studying the scientific principles of the subject—whether it be chemistry, engineering, or on the commercial side.

Why not apply this method to a gas undertaking—allow the junior to work two days in the laboratory, in the drawing-office, or on the works, as the case might be, and send him for a day or two to study at a suitable college or university alternately? If the gas undertakings of Lancashire and Cheshire combined in the support of such an arrangement, a suitable centre—such as Manchester—might be fixed upon, with perhaps the College of Technology as a suitable Institution for study; special lectures being arranged to suit the different subjects. Perhaps the Senior Gas Association may think it advisable to take up this matter, and so make a start in an organized method of education for the future staffs of the undertakings taking part in the scheme; each apprenticed student being bound to his works for a certain period. Owners of gas undertakings must be made to realize the importance of the proper education of their juniors particularly; and, so as not to allow a relapse of their studies, encourage them by allowing them to pursue these in working days—receiving reports from the heads of departments and from the colleges weekly or monthly. Personally, as an evening lecturer, I have found, speaking generally, the younger the student the keener the enthusiasm shown. Over a certain age, falling off of concentration and interest occurs.

By such a scheme as is outlined above, we should be able to put the right man in the right place, and provide a number of high-class men for efficient carrying on.

EVIL OF FALSE ECONOMY.

False economy is rampant in many works. Are the labour and the materials used in the repair, and the loss incurred due to the breakdown, of any part of the plant booked against the offender? I have known the repairs and loss due to the stoppage of a pump during twelve months to cost considerably more than a new one could have been bought for. How does this apply to other classes of machinery? A record will show. It does not, of course, necessarily follow that a new machine should always be ordered; but systematic records will indicate the chief offending part of the machine and lead, perhaps, to some simple alteration in design which will prevent future breakdowns and give long life to the machine.

LOOK AFTER THE STORES.

Scientific management teaches us to look carefully after the stores. Surplus stocks mean capital locked up; and we must not have work delayed through want of material. The stores, however small, should be in good order and control, stocked systematically, and goods be given out only on production of a signed order. Nothing is more disastrous than to have stores dotted about a works for all and sundry to help themselves. Two things should be insisted on: First, the records should be kept in such a form as to give a "perpetual inventory"—that is to say, to show at a glance the number of each article in stock. Secondly, the safe number should be indicated of each article that should be kept in stock; this serving as a guide to the quantity that should be ordered.

The card or tag index system is gradually coming to the fore. A card or tag is given to each kind of article, on which is recorded the number sent in, and that given out to the works, thus showing automatically the balance remaining in stock. A special number on the card gives the maximum number of the particular article that should be kept in stock—always allowing for late delivery of materials. A management careless in keeping account of its own material cannot expect workmen to have much concern about wasting it. The card-index system is now greatly used in office work, and is worthy of more extensive employment in the works itself.

And so we may pursue our investigations, not only into any department as a whole, but to the smallest of operations—*i.e.*, the science of shovelling, to determine the most efficient size of shovel and fork. The largest shovel has been proved to be the most inefficient. Yet many try to get as much material on as possible. Then there is the size of the barrows. Are they well balanced, the handles at a suitable height, &c.?

CONCLUSION.

If I have given you and others food for thought in my few remarks, I am well satisfied, and hope we may at future meetings have papers and discussions on some of the principles of scientific management as applied to a gas undertaking.

Mr. S. E. Whitehead, proposing a vote of thanks to Mr. Teasdale, remarked that the question of labour was paramount everywhere. He recently heard Mr. Charles Carpenter, D.Sc., say that labour troubles were in the main caused through lack of education. He (the speaker) thought there was a great deal of truth in this. The question of education applied to the whole of the staff—to the administrative officers and to the technical men. Science had not been applied as it might have been to gas manufacture; but if they applied science and common sense together, they would undoubtedly benefit the industry.

Mr. W. W. Woodward seconded, and said he felt very proud that his Chief Assistant had been chosen as President of the Association, and also proud that Mr. Teasdale was capable of presenting such a thoughtful address. The question of labour was a very acute one at present, as also was the question of the men who were to carry on the gas industry in the future. At Salford, they had started a scheme that no junior would be engaged in the clerical department of the Corporation until he had passed an entrance examination held by the Education Authority, which would be in the nature of general knowledge. After passing the examination, the youths would be put on a graded scale; and their annual advances would be subject to a satisfactory report from the head of the Department, and also conditional on attendance at a continuation school up to the age of twenty-one. This scheme came into operation on April 1; and they hoped to have a better educated type of clerk in the future. The scheme might be carried further to other departments. On behalf of the Chairman (Alderman F. S. Phillips, J.P.) and members of the Salford Gas Committee, he desired to say how sorry he was that, owing to the war, he was not able to invite them to Salford and entertain them; but this was hardly a time for jollification.

Mr. R. Sayers noticed that in one part of the address the President very nearly gave them a suggestion as to how one thing should be carried out; but then he withdrew, and left them to consider the point for themselves. The subject of the scientific management of gas-works had always been a fascinating one to him. Personally, he thought that, when considering the proposals of the President, they should try and break away from the old-fashioned rule-of-thumb methods. If, for instance, any of them had had handed down to them a book or a system by a predecessor, they should see whether it could not be improved upon. He had also been interested in the subject of teaching apprentices. The President commenced his career as a gas engineer with him; and he was delighted that he had risen to such a position as he had. It had been said that the younger element seemed to be keener to take up their studies than the older. Why was this? Because they began at the bottom; and herein lay the importance of the whole matter. He believed many men to-day were thrust into positions without having had a proper primary education. Many apprentices were to-day taken away from school too soon, and put into a position on a works without proper grounding. At their own works, they had recognized the value of junior technical schools, and thought it best to select from them the students who had shown aptitude and natural ability which would give them the opportunity of studying. They must also recognize that they had a moral obligation with regard

to the youths they took on as apprentices. They must not turn them away with a "half knowledge" of the subject. Therein lay the *crux* of what the President said. If they had a better educated type of man, both in the office and in the works, it would lighten the responsibility of the management.

The President briefly returned thanks; and the members adjourned for tea.

NAPHTHALENE.

In the evening, the members resumed consideration of the paper by Mr. W. Fletcher, of Liverpool, entitled "Naphthalene," read before the Association at Ormskirk on Feb. 2 last, and reported in the "Journal" for Feb. 5 (p. 248).

The President (Mr. C. E. Teasdale), in opening the discussion, said that unfortunately he was not able to be present at the Ormskirk meeting, but he had read the paper as printed in the "Gas Journal." Mr. Fletcher was unable to be with them on account of illness; and Mr. Carter was deputed (to a certain extent) to reply on his behalf. Glancing through Mr. Fletcher's paper, it appeared that not only did he give them the remedy, or attempted remedy, of the naphthalene bogey, but he attempted to indicate what caused the naphthalene. To his mind, one of the chief causes was that very often the charges were put in short. Consequently there was sometimes an amount of empty space in the retort which had the same effect as a lighter charge. He also thought that holes in retorts through which inert gases were drawn with local heating produced naphthalene. He did not know of any investigation on this point, or whether any particular works had made any experiments in this direction. Mr. Fletcher had certainly illustrated the different methods of overcoming these naphthalene troubles. The greatest experience he (the speaker) had had with regard to the cure was the atomizer. He had the pleasure of seeing erected one of the first plants of the atomizer type. The oil vapours were admitted through two acetylene burners with the jets set at an angle which caused great dispersion of the mist or fog, reducing the naphthalene almost to a minimum. This oil vapour was introduced immediately before the governors; the oil being atomized at 80 lbs. per square inch pressure. To his (the speaker's) mind the root of the evil ought to be tackled. If they could find out that the naphthalene trouble was due to bad retorts or bad charges, then they should concentrate their attention on this

Mr. W. Buckley (Manchester) considered there was a solution of the naphthalene problem, whereby the naphthalene was entirely eliminated—vertical retorts.

A Member: Rather expensive!

Mr. Buckley said this was open to question. They had with them that afternoon a gentleman at whose works they were obtaining 16,000 or 17,000 c.ft. of gas per ton of coal carbonized; and they were not getting more than 8 p.ct. of diluents in the gas, and were not troubled with naphthalene. Mr. Fletcher mentioned that it was not the large amount of naphthalene that caused the trouble, but the fact that it crystallized. Mr. Fletcher mentioned adding the solvents in the rotary washer in the first three chambers. Personally, he was of opinion that much better results would be obtained if the solvents were put in the last three chambers. Most of them who had anything to do with rotary washers knew that the pressure caused was due to the deposits in the last chambers. This was caused by the phenols in the gas and the ammoniacal liquor which assisted in the prevention of the deposition of naphthalene. He had found the twelfth chamber to be nearly blocked-up with solid naphthalene. In the eleventh, tenth, and ninth chambers the naphthalene was present in diminishing quantities; and the eighth chamber was very nearly clear. In spite of this, Mr. Fletcher got a very high efficiency from his washer. He (the speaker) had worked it out to be 64 p.ct. Further, he could not see how the spraying of such a small quantity of oil into the gas as mentioned by the author could keep the naphthalene in suspension, or, if deposited, to remove it in a state of solution. The amount of solvent sprayed into the gas worked out to be only 0·06 p.ct. by volume, which was negligible. He understood that Mr. Simmonds admitted more solvents, which would occupy a larger volume. In the Parkinson vaporizer that Mr. Fletcher employed, the quantity of solvents used he (the speaker) worked out to be 0·04 p.ct. He would like to ask the author whether he had carried out any tests to determine whether the quantity of moisture in the gas had any influence upon the behaviour of the naphthalene. They were all familiar with the work of Brémond, who eliminated the whole of the moisture from the gas and at the same time deposited the naphthalene. In 1915, on the instructions of his late Engineer (Mr. J. G. Newbigging), he commenced a series of tests to find out whether there was any connection with maximum and minimum temperatures and the quantity of naphthalene present in relation to the district served by the works. These experiments were going on in April, 1916, when he was taken away from the works, and the experiments were never completed. He would like to ask whether any of the members had ever carried out any experiments to see what effect moisture had on the behaviour of naphthalene. There was one other point in Mr. Fletcher's paper. He could not understand naphthalene being deposited in the fittings inside the house. He had never come across such an occurrence, which seemed to him somewhat extraordinary. He could understand it if the house was a new one, and if the walls, through not being quite dry, produced a low temperature.

Mr. S. E. Whitehead (Ministry of Munitions) said he also agreed with the President with regard to holes in retorts. Experiments had been carried out which proved that retorts with holes in them, or leaking retorts, with overdrawing, increased the naphthalene content. The reason was evident. The fact of over-pulling increased the naphthalene content, with the result that they obtained a higher temperature reaction. When he read Mr. Fletcher's paper, he was glad to see he had called them solvents instead of carriers. It seemed to him that the term "carriers" was an unfortunate one, and had given rise to the idea of carrying the naphthalene. The word, he thought, was wrongly used. The aim was to admit a hydrocarbon or such oils as would condense and take away the naphthalene in a liquid state. He would like to ask whether any experiments had been made with regard to the absorption of tar. Mr. Fletcher asked whether the gas retained a considerable portion of the gas atomized into it. It seemed to him (the speaker) that this was partly mechanical and partly physical. The atomizer injected the oil in the form of a mist; and it almost seemed feasible that the heavier portions would tend to come down and absorb the hydrocarbons in the gas. He would like to know whether Mr. Fletcher had examined any of the oils coming from the carburettor. Mr. Simmonds's atomizer was no doubt very efficient, especially where naphthalene troubles were severe; but he did not consider it good practice to pump air into the gas. In these days, the tendency was to keep down the inerts in the gas. It would be much better to admit gas under pressure in the atomizers. In this connection there were several vaporizers at work. Gas was used instead of air; and this seemed to him to be the preferable course to adopt. With regard to corrosion, he would like to know if the corrosion found in service-pipes where atomizers were in use was not due to the amount of oxygen added. It was a well-known fact that over-pulling and excess of oxygen had given rise to serious corrosion; and he would like to know whether it was due to the oxygen used in the atomizer.

At this stage the President introduced a variation of the conversational discussion method of procedure; and the subsequent discussion proceeded on the lines of an informal across-the-table type of argument—Mr. Teasdale calling upon the members individually to relate their experiences. The new method worked extremely well, fully two-thirds of the thirty-five or forty members present taking part in the subsequent proceedings; not the least interesting experiences being related by the representatives of small undertakings.

At the conclusion of the discussion,

The President said they had not succeeded in solving the problem, although they had had a good many diverse views on the subject. Certainly the point that vertical retorts produced a minimum of naphthalene was worthy of their future consideration. It was no use their going against practical results. If it was so to the majority of those who used vertical retorts by themselves, then they must hold their hands up and say it was probably due to the vertical retorts. At the same time, if the vertical retorts had only just been introduced on an old system of mains, and the cure began straight away, they would have to say the old bogey was the horizontal retorts—in short, they would have to reason it out in their own way. He concluded by calling upon

Mr. S. Carter (Garston, Liverpool) to reply to some of the points raised in the discussion. He said it was out of consideration for, and at Mr. Fletcher's request, that he replied on his behalf. With regard to Mr. Buckley's statement that vertical retorts were the cure, while this was encouraging to works beginning to instal these systems, it was not very encouraging to small works that had recently spent large sums of money in putting down power stoking machinery. With regard to the question of passing the gas through the charge, there had been some controversy on this matter; and he did not profess to be able to judge as to whether the gas did pass through the coal or coke, although it was certain that the hydrocarbons did pass. He considered the amount of air admitted into the gas by the atomizing plant was negligible, and did not think it had any effect on the corrosion of the service-pipes. He was of opinion that if the mains and service-pipes were coated on the inside with a film of oil, it would be of benefit; and the atomizer contributed to this state. It was not much good using water-gas tar, unless it had a water content of not more than 3 p.ct.; without it, there was no efficiency. In regard to filtering out the moisture, it might filter or separate out the water, but might not filter out the naphthalene.

The President, in thanking Mr. Carter for replying, on behalf of Mr. Fletcher, said the whole course of the discussion had been quite open and unrestrained. He certainly proposed to continue the open discussions and across-the-table talk, as by this means they had views put forward which otherwise they would not get.

The usual votes of thanks terminated the proceedings.

Relieving Gas Shortage at Detroit.—There is a thoroughness about methods adopted at times to meet emergencies in the United States which compels recognition; and an instance is to be found in means recently taken to relieve a shortage of gas in Detroit. According to the "American Gas Engineering Journal," the Detroit (Mich.) City Gas Company found their difficulties solved, temporarily, at any rate, by the action of the Fuel Administrator and his assistants in seizing fifteen cars of gas oil and several cars of coal which had been consigned to various industrial plants, and diverting them to the Gas Company. It is stated that the Fuel Administrator seized only cars consigned to firms who were less in need of coal and oil than the Gas Company, who had just at that time been threatening for several days to shut-down, unless immediate relief was forthcoming.

Spent Oxide for Eradicating Weeds.—As the manager of a combined gas and electric company, with a rather small plant, Mr. M. G. Hall, of Santa Rosa (Cal.), last autumn hit upon a plan, as related by him in a "Pacific Coast Wrinkle," of utilizing his spent oxide, the disposal of which in years past had given him some trouble. At the time referred to, when he was struck with the idea that some benefit might be derived from it, there was a considerable quantity to be disposed of; and it happened to be at the period of the year when it is necessary always to hoe the grass from around the high-tension poles. Therefore he had the oxide spread round the poles within a radius of some 3 ft. It was successful in killing the grass, though some weeds—such as dock, which has a large, bulbous root, and is a perennial—have not been completely finished off. On the whole, however, he is very well satisfied with the experiment. It cost a little more to dispose of the oxide in this way than by the ordinary method; but the matter is otherwise when the labour required to hoe the grass is considered in addition to that necessary to dispose of the spent oxide of iron.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

The Annual General Meeting of the Scottish Junior Gas Association (Western District) was held on Saturday last in the rooms of the Royal Philosophical Society of Glasgow. The retiring President—Mr. Alexander Wright, Lockerbie—in his opening remarks, complimented the various members who had been advanced during the past year.

Annual Statement.

The Hon. Secretary and Treasurer (Mr. Arthur T. M'Donald) submitted the annual report and financial statement. The total membership was the same as in the previous year. There had been five new members and five resignations. They had two patrons, 21 honorary members, and 152 ordinary members, 30 of whom were serving with His Majesty's Forces. The credit balance was £13 18s. 9d., compared with £12 5s. last year.

Office-Bearers.

In the subsequent election of office-bearers, Mr. David Marwick (Greenock) who was Vice-President last year, automatically became President, and Mr. Thomas Moffat (Tradeston) was appointed Vice-President. Mr. M'Donald was re-appointed as Hon. Secretary and Treasurer.

LECTURE BY MR. ALEX. YUILL, OF DUNDEE.

On taking a retrospective view of matters pertaining to our profession, and considering the vicissitudes that we have experienced during the past two decades, we are conscious that the advance made can compare favourably with any previous corresponding period. In our younger days, we were reminded of the advice that was looked on by some as axiomatic: "To keep up the heat of the retorts; to keep up the efficiency of the meters; to keep down the pressure in the mains; to keep down the arrears in the gas ledger." While we still require to give attention to three of them, the evolution that has taken place in incandescent lighting and the great advance in cooking and heating by gas have altered our ideas as to pressure in the mains. Now, the newer adaptation is "keep down the leakage." In considering this, we are faced with the fact that, despite the higher pressures now ruling, the percentage of loss is less than it was when 5-10 in. was the recognized pressure during the daytime. With the low pressure an escape may go on for some time before being discovered, whereas with the higher pressure the leakage is soon found out and put right. In my opinion, the high illuminating power of the gas formerly supplied contributed to some extent to leakage, due to the condensation of the unsaturated hydrocarbons, more especially those having a high specific gravity.

Evolution in the Industry.

Looking at our position from a prospective point of view, we are faced with the fact that at no period during the past have we been confronted with the spirit of evolution that is now before us. The introduction of the vertical retort appears to create as great an economic change as it did to the oil industry some years ago. One may ask why this was not effected earlier. In considering this phase of the position, we must bear in mind that the public were not sufficiently educated to the quality of gas best suited to altered circumstances. The introduction of incandescent lighting and the large percentage of gas used for cooking and heating has now convinced even the lay mind that a high grade gas was not economical, nor was it even essential for everyday requirements.

We must not lose sight of the fact that, while we are subject to the above law, we must ever keep before us the responsibilities that are expected from us in leading public opinion as to what is, from a practical point of view, best suited to our consumers. In the supply of gas one point has not received the attention that it deserves—that is, as regards the percentage of inert matter. I refer particularly to the presence of carbon dioxide, nitrogen, and oxygen. Some time ago I observed that an eminent gas engineer considered that the percentage of these gases ought not to exceed 12½ p.ct. While this may be looked upon as a minimum in the carbonization of coal in horizontal retorts, this minimum may be reduced 50 p.ct. in vertical retorts, more especially if a supply of superheated steam is introduced. In the decomposition of the steam, the hydrogen, while in the nascent state, combines with the nitrogen to form ammonia, and the oxygen with the carbon to form carbon monoxide.

In my opinion, the introduction of blue water gas to the vertical retort at a high temperature would play an effective part in enveloping the gaseous hydrocarbons so as to prevent their decomposition, particularly in the hot zone of the retorts. It is possible that in the near future this idea may be experimented upon so as to determine the advantages or the disadvantages as compared with steam. In the case of water gas, no heat would be absorbed as occurs when steam is used, and the extra condensing power required would be saved.

Management Qualifications.

We have now reached the stage when the engineer, the chemist, and the accountant must go hand in hand; and should anyone have these qualifications, the better is he fitted to undertake the management of a gas undertaking at the present time. I have no desire to enumerate the multifarious duties of the manager from an engineering point of view, as this is quite well known to most of you.

The chemist, in any well-regulated works, occupies a position entirely different from that which he did twenty years ago. He looks on a piece of coal as a chemical substance, and brings his scientific knowledge to determine what value he can take out of it—not only from a gas-making point of view, but also from the point of residuals what he is able to extract from it. Among his other duties he is closely engaged in the testing of constituent gases, the determining of the percentage of ammonia in the sulphate and the free acid in it, also the spent liquor and the devil liquor. In Dundee, these tests are recorded and put in graph form. We have a standard for each; and should it deviate from the standard, explanations require to be given. Tests are also made to determine the percentage of CO_2 in the flue gases, both from the retort-bench, horizontal and vertical, and also from the steam-boilers. It is not necessary for me to enlarge upon the other work that may be performed by the chemist, as anyone with a chemical knowledge and an investigating mind may extend his duties to any extent he may desire.

Accountancy.

I cannot speak too highly of the benefits to be derived from a training in accountancy—it is of infinite advantage to the gas engineer, more especially if he brings his knowledge of statistics to his aid, as thereby comparisons may be made not only with his own records, but also with those of others, and at a glance he may determine where leakages are, and how economies may be effected. I may be pardoned for drawing attention to a few of the duties that may be placed within the province of the accountant, such as keeping a record of all accounts passed for payment, and docketing these under the different departments, such as general repairs, retorts, carbonizing, purifying, meter repairs, gas-stove repairs, and all the various items as noted on the debit side of the revenue account. This includes not only the materials purchased, but also the wages chargeable against each item. A monthly record should be kept; so that comparison may be made with the corresponding period of the previous year. A summary of these will assist in making a balance quarterly, half-yearly, or for the whole year.

As regards the wages paid, it will be found advantageous to work out weekly the costs per 1000 c.ft. of gas made even to two places of decimals, so as to compare with previous results. When this is studiously and regularly carried out, nothing contributes so much to stimulate your desire to effect economies where these are possible or necessary. In the keeping of records of meters, stoves, and fires, I find the card system a great advantage. We also have a very efficient card system in connection with our stove department. This has been in operation for a number of years, and has proved quite a success. There are seven different colours representing different classes of orders—viz.: Complaints, applications for cooking appliances, applications for heating appliances, exchanges, returns, removals, and sales.

When a complaint or order is received, a card is made out with the name and address of the consumer. This is passed to the superintendent of the department, who hands it to the gas-fitter. If it is a gas escape, the job is attended to instantly; if some repair work is required, it is followed up in the course of the day along with other jobs. The fitter, on completing his work, fills in his time and any particulars needful on the card, and returns it to the superintendent, who in turn hands it back to the office.

In the case of applications for appliances, the superintendent hands the card to the inspector, who arranges with the consumer as to the cooker or fire most suitable, and enters the particulars on the card along with measurements for piping, &c. The card is then returned to the superintendent, and the appliances are selected, laid out, and labelled, along with the necessary piping, to be delivered to the consumer's premises. The gas-fitter, having received the card, follows up and completes the work, enters the necessary particulars as to material, time, &c. All cards are returned to the superintendent in the morning, and, after they are duly checked, are passed to the office, where the necessary records are kept. An index is used, and the cards are stored for reference. One of my assistants, Mr. Johnston, dealt very fully with this subject in a paper he read to the Scottish Junior Association (Eastern District) in February of last year. [See "Journal," Vol. CXXXVII, p. 411.]

Assessment and Income-Tax.

While I have mentioned some of the duties coming under the purview of the gas manager as an accountant, there are other subjects of which it is advisable he should make a careful study—viz., a knowledge of the laws that govern the computation of the assessable value of gas-works, also that of income-tax. While these differ in some respects, there is also a similarity. As regard the return of assessable values, I find that in a great many instances the amount entered as tenant's capital is considerably underrated. Some may ask what may be claimed as tenant's capital. I answer this by stating that, after deducting what belongs to the hypothetical landlord, the balance belongs to the hypothetical tenant. To determine what is landlord's capital, we may take decided cases, where it has been held that the landlord requires to provide retorts, condensers, exhausters, scrubbers, purifiers, station meters, gasholders, and main pipes and all services laid underground, so that a tenant may take possession and produce gas. The rest may be claimed as tenant's capital.

The computation of the income-tax return in some cases is left to the assessor, who determines the amount chargeable from the annual statement of accounts. Sometimes a due allowance is made for depreciation; but I am afraid that in other cases a little knowledge as to the proper method of computing would be advantageous to the company or corporation concerned.

I have not exhausted all the duties that may be taken up in this department. Suffice it to say I have found it advisable to keep a close watch on all statistical records of each department, so that comparisons may be made from time to time with past results. There is nothing more instructive than in determining the position our contemporaries occupy—that is, as to the progress they are making.

A Decade's Increase in Gas Consumption.

I have prepared the following table showing the gas made in various towns in Scotland with sales of over 100 million cubic feet per annum, for the years 1908 and 1918 (as taken from the "Gas World Year Book" for 1918), to determine the increase during that period:

Order.	Make of Gas in		Increase.	Increase.
	1908.	1918.		
	Millions.	Millions.	Millions.	P.Ct.
1	168	314	146	86·6
2	65	101	46	70·7
3	759	1104	345	45·4
4	105	150	45	42·8
5	118	167	49	41·5
6	725	1010	285	39·3
7	168	230	62	36·9
8	115	157	42	36·5
9	359	474	115	32·0
10	92	119	27	29·3
11	107	134	27	25·2
12	119	149	30	25·2
13	83	103	20	24·1
14	6954	8524	1620	23·3
15	154	183	29	18·9
16	210	249	39	18·6
17	446	509	63	14·1
18	204	211	7	3·4 Decrease.
19	2047	2019	28	1·3
20	146	126	20	13·7

It is natural to suppose that anyone finding himself in a position he does not covet, there would be an incentive to occupy a higher place.

The raising of the day consumption is a great factor in contributing to the success of any gas-works. I find that in Alloa the day consumption during the months from April to September was raised from 9·58 p.ct. in 1893 to 52·23 p.ct. in 1913. In Dundee, the day consumption in the month of June, 1903, was 52·18 p.ct., and in 1917 it had increased to 67·24 p.ct. An increase in the consumption of gas reduces the fixed charges in the ratio of the increase. In 1902, the interest, annuities, and sinking fund charges cost 10·16d. per 1000 c.ft.; in 1914, it had fallen to 6·27d. There are other fixed charges—such as salaries, feu duties, rents, &c.—that decrease in the same ratio. Consequent on the above increase, the price of gas to the consumer may be reduced 4d. per 1000 c.ft.

Returns from Secondary Products.

Other comparisons may be made, such as the income received from residual products—*i.e.*, coke, tar, and sulphate of ammonia. I have taken out the figures for the undernoted, and have placed them in the order of their percentage value.

Order.	Coal.	Bye-Products.	Percentage Return for Bye-Products on Amount Paid for Coal.
	£	£	P.Ct.
1	13,762	9,930	72·15
2	21,778	15,703	72·10
3	165,587	115,260	69·60
4	9,446	6,213	65·77
5	93,240	55,423	59·44
6	22,183	13,107	59·08
7	9,226	5,431	58·86
8	4,526	2,646	58·46
9	41,562	23,844	57·37
10	11,209	6,419	57·26
11	767,218	426,401	55·57
12	6,252	3,201	51·19
13	2,852	1,093	38·67
14	8,580	2,855	33·27
15	11,549	3,800	32·90

It must be borne in mind, when making the comparison, that there are several towns in close proximity to the coalfields obtaining supplies of coal at a less rate, owing to lessened railway charges; while there are others so situated that they are able to command a better price for the tar produced, owing to the low railway carriage to the works of the tar distillers.

I find that in some cases the expense incident to the handling of the bye-products—such as wages and materials for repair—are not carried to the debit of these accounts. Consequently, the results given may be higher than they should be. After these allowances are made, the fact remains that there are two or three on the list which ought to show a better return than that given.

The cases I have mentioned may stand as examples of the benefits to be derived by anyone who is anxious to compare his results with those others are able to obtain.

Personally, I consider that the functions performed by the chemist and the accountant at the present time contribute more to the successful management of a gas-works than those performed by the engineer. I do not wish to be misunderstood in this statement, for in the *personnel* of the manager I am combining these three qualifications—*i.e.*, he must be qualified to undertake all these duties; and the more he is qualified, the better is he fitted to fill the position.

Coal Quality and National Service.

In considering the present position of the gas industry during the past two or three years, and the difficulties we have all experienced, due to circumstances over which we have no control, we sometimes imagine that those who are in authority in controlling our supplies have underestimated the position that the gas industry occupies and the part it has played in assisting the Ministry of Munitions in the production of tar for the manufacture of the higher explosives. The Department which regulates the production of oil for Admiralty purposes is anxious to increase this as much as possible. That being so, why do they not arrange, through the Coal Controller, to supply to gas-works coal that gives a maximum amount of tar, instead of, as in the North-East of Scotland, virtually confining them to a coal that gives a minimum quantity of tar.

The supply of coal to gas-works has not received the consideration that it deserves by the Coal Controller. He appears to ignore or be ignorant of the fact that gas-works at the present time spend about 50 p.ct. of their total income on coal—in fact, coal to a gas company is much the same as cotton or jute is to the manufacturer. I do not complain so much as to the price charged as to the quality that is being supplied, both from the point of view of gas production and the quality and quantity of the residuals. I cannot understand why railway companies have been placed in such a favourable position in the purchase of coals compared with gas companies. Our passiveness in this respect may be taken as an index to our patriotism.

Calorific Value and Flame Temperature.

I have no desire to follow in detail the various processes in the manufacture of gas from the retorts to the station meter, as these have been gone into in detail by others. Possibly some of you may have observed that the amount of light given off by the incandescent mantle has increased rather than diminished since the illuminating power of gas has been reduced. This also appears to be maintained despite a reduction in the calorific value. Undoubtedly this is due to the constituents of the gas which on combustion induce a higher flame temperature than that given by a gas having a high percentage of the unsaturated hydrocarbons. Suppose we take the undernoted gases and burn them to complete combustion, so as to determine the amount of air required:

Olefiant gas . . $C_2H_4 + 6N_4O = 2H_2O + 2CO_2 + Nx$
Methane . . . $C\,H_4 + 4N_4O = 2H_2O + CO_2 + Nx$
Carbon monoxide . $C\,O + 1N_4O = — + CO_2 + Nx$

We find that before the complete combustion of the olefiant gas can be effected, it requires six volumes of air. Marsh gas requires four volumes of air, and carbon monoxide one volume of air. It is natural to suppose that the presence of nitrogen in the flame in the first will have a cooling effect due to its inert nature. The same will be experienced with marsh gas in a lessened degree. The carbon monoxide requires four volumes less of air for complete combustion than is required for the marsh gas. I have taken N_4O in the above equations, not as a chemical compound, but as a symbol that may represent the constituents of the atmosphere as nearly as possible. Further investigation into the laws governing flame temperature will not only redound to the credit of the investigator, but will be to the benefit of the gas industry.

I am afraid I have trespassed too much on your time; but if you feel benefited by the foregoing remarks, I am amply repaid.

Mr. Napier (Alloa), in moving a vote of thanks to Mr. Yuill for his lecture, said he was glad to see the consideration and importance which the author insisted ought to be given to the chemist and accountant. One statement he had made in reference to the practical working of vertical retorts he was unable to subscribe to. Mr. Yuill had said the future would demand the use of water gas in the vertical retort as a means whereby the products both of gas and tar would be better. Having regard to the necessity of conserving our coal supplies and to the highest attainment in the carbonization of coal, it followed that if they were able to convert more of the carbon content of the coal into gas, the advance would undoubtedly be best for the manufacturer and the consumer. It was beyond doubt the case that what was required was a large volume of gas created from the gasification to a larger extent of the carbon content of the coal. The presence of water gas acting as a diluent did not meet the case, whereas with the injection of steam one had decomposition resulting in the nitrogen content of the coal being converted into ammonia, with the production of valuable residuals increased. There was also an added volume of gas. This represented the trend of the times, whereby the consumer was going to be supplied with a cheaper gas.

Mr. Yuill, in reply, said that on investigation they might find that by utilizing to some extent superheated steam with a volume of water

gas, also heated, they would get greater results than by using steam alone. He did not condemn the employment of steam alone or advocate the use of water gas alone; but he considered that they would find it wise to use both.

At the close of the business meeting, the members spent a pleasant social evening in Rombach's Tea Rooms.

COKE-OVEN MANAGERS' ASSOCIATION.

NORTHERN SECTION.

A Paper by Dr. J. T. Dunn.

The last Meeting of the Northern Section of the Coke-Oven Managers' Association, at Darlington, was addressed by Dr. J. T. Dunn, F.I.C., of Newcastle-on-Tyne, upon the subject of the "Chemist and the Coke-Oven." The following account of what he had to say is from the pages of the "Chemical Trade Journal."

A few years ago, he said, if one had suggested to a colliery proprietor in Durham, who coked his coal in beehive ovens and sold his coke, that he was really a chemical manufacturer, and that he ought to have a chemist to conduct his work, one would have been laughed at. The object of the coke-maker was, of course, from a given quantity of a certain coal to produce as good a coke, and as much of it, as he could, and, at the same time, to produce as many of the bye-products in as large a quantity as possible. He required for this purpose to know something about his materials, and also something about the treatment through which he was going to put these materials. It was quite clear that, in order to do this, he required, at any rate, chemical analyses. He must know something about the analyses of his coal and coke; and, if he was making sulphate of ammonia, he had to have methods of determining the strength of his ammonia liquor and of his finished sulphate. He might even have to make routine tests of pyrites and of materials for sulphuric acid making, or, if he was buying acid, he must be able to test the strength and purity of his deliveries. He had also to have methods of determining the value of his benzol when produced.

It was possible to have a man trained to do this routine work who might do it very well so long as things were going satisfactorily, but who might, nevertheless, have no very extended knowledge of chemistry. If the object of the coke-maker was to do his best with the materials, he needed something more than such a man. It was not simply chemistry, in the narrow sense of the word, that was needed; there was a great deal of physics as well. The wider a man's knowledge—the wider his training in every branch of physical science—the more likely was he to be able to overcome difficulties that might present themselves, and to initiate improvements in his processes. Coal was our greatest national asset, and an asset which we should have to economize, in the true sense of the term, as well as we could, using it to the best advantage. A man who had had a wide training, and then had to turn himself in some particular direction, would almost always have an advantage over the man who had been trained only in that particular direction, even though he might have been trained for a longer period than the other man.

High and Low Temperature Distillation.

Discussing the question of high and low temperature distillation, Dr. Dunn remarked that of late years low-temperature distillation had been in a good deal of very needless controversy as to its merits and demerits, as distinguished from high-temperature carbonization. The two processes appeared to him to be, each of them, useful in its place. It was quite obvious that one could not, and never would be able to, use a low-temperature distillation process for the production of blast-furnace coke or large quantities of low calorific power gas, such as were produced in a gas-works, and that, therefore, it was absurd to speak of low-temperature distillation as being preferable, or not preferable, to high-temperature distillation. There was also the fact that, when one distilled coal at a low temperature, the different class of products indicated that these products themselves might fill a space in our industrial economy not filled by any of the products of high-temperature distillation.

There were very marked differences between the products of the two distillations of the same coal. One got a larger yield of coke in a low-temperature process than in a high temperature; but this coke, though (when made from a good coal) forming a most admirable domestic fuel or for any purpose where a smokeless fuel was wanted and where hardness or density was not important, would be of no use whatever for many purposes for which coke was used, because it was soft and readily crushed. It still contained a considerable amount of volatile matter, and was no substitute whatever for hard or blast-furnace coke. Again, the gas obtained under these circumstances was very much smaller in amount than from high-temperature distillation in a gas-works, and it was correspondingly richer in heavy hydrocarbons. If it were scrubbed, one found that, though one got light liquid hydrocarbons similar in character to the benzol one obtained by scrubbing coke-oven gas, they were not benzol at all, and were of no use whatever for the production of benzol derivatives, such as were needed for explosives, aniline dyes, or any of the other enormous number of synthetic chemicals which they knew were made from benzene or its homologues obtained from coal tar in ordinary high-temperature working. Distillation at low temperature resulted in a very much greater quantity of liquid products—of oils—than distillation at high temperature. But these oils, though useful for fuel purposes, and though when they come to be investigated they might be found to contain products which would be very useful for particular purposes, were paraffins or cyclic paraffin hydrocarbons almost entirely, and the tar contained no hydrocarbons or very little hydrocarbon of the benzene series.

An interesting point in connection with low-temperature distillation was that some French investigators had extracted from coal by means of solvents some of the same hydrocarbons of the tar or the oils which they got by the low-temperature distillation, indicating that, while most of the products of low-temperature distillation were due to destructive distillation, some of them were existent in the coal itself, and at a low temperature were simply distilled without changing their composition.

WASTE OF AMMONIA IN THE SMALLER GAS-WORKS.

In view of the present shortage of about 60,000,000 lbs. of ammonia per annum in the United States—ascribed by the Food Administrator to the requirement of 150,000,000 lbs. for munitions and of 40,000,000 lbs. for cold storage, against an annual production of only 130,000,000 lbs.—Mr. John S. Unger, in the American "Gas Record," discusses the fact that many gas-works in the country, even of fair size, run their ammoniacal liquor to waste, incurring the risk of contaminating water-courses in many instances. He asserts that every gas-works carbonizing not less than 3000 tons of coal might, with advantage to the national needs and their own profits, obtain an ammonia still and make concentrated liquor, or, where size admits, produce sulphate or aqua ammonia. Often, the explanation was a psychological one; the manager responsible for the outlay being a pessimist more influenced by the failures of others than by the success of those who recovered ammonia and secured a substantial profit. So it happened that one small works made a respectable income on this item, while another (perhaps double the size), allowed the liquor to go to waste. Among the reasons for this course were the assumption that the staff already had their hands full, insufficient condensing and scrubbing capacity, lack of storage room, distance from market, and other difficulties which generally could be remedied without excessive trouble or expense.

As an example of a modern gas-liquor concentrator, he gives an illustrated description of a 30-in. still used at a gas-works in Illinois, which in 1917 produced 36,511 lbs. of ammonia. The quantity of coal carbonized during the year was 8166 tons; and after correcting for stock, the average yield was 5·05 lbs. of ammonia per ton. The consumption of hydrated lime for driving off fixed ammonia was 1·55 lbs. per ton; and the manager claims that he can easily obtain 5¼ lbs. per ton from a mixture of two parts Kentucky and one part Illinois coal. The steam supply to the still is controlled by a thermostatic automatic regulator; the milk of lime is injected by compressed air, and is also under automatic control; and by expelling some of the acid gases in the superheater, a 20 p.ct. concentrate can be obtained without any trouble from the accumulation of carbonates. The apparatus is placed in the condensing and scrubbing room, and involves no extra labour; being run in the day only, and looked after by the works foreman. The year's operations have amply covered the installation cost.

Coal Tar.

"The discoverer of the modern use of coal tar was English; but the Germans developed the idea. We detest sustained thought, as is shown by the disappearance of chess in favour of golf and bridge—all of a piece this, with the surrender of England's discovery of aniline dyes to industrious German patience, which can, and does, concentrate, whether on war or aniline dyes. We have yet to learn that the secrets of science are only unravelled by concentration of thought and disciplined mental and physical exertion." With these words the "Saturday Review" concludes an article on "Coal Tar," in which are set out, in readable style, many of the things that owe their origin to coal tar—with the added remark that we cannot foresee a tithe of its uses, "because over 150,000 combinations and permutations of the compounds of carbon are known to organic chemists, and every day some fresh wonder emerges under the chemist's eye—some fresh example of serendipity."

A Joint Industrial Council for the Chemical Trade.—There is a scheme for establishing a Joint Industrial Council for the chemical trade on the lines of the recommendations of the Whitley report; the Ministry of Reconstruction having invited the Association of British Chemical Manufacturers to appoint representatives to serve on an interim industrial council. It is understood that, for the purposes of the scheme, the "heavy" chemical industry will be linked with the "light" chemical industry, so that there shall be one council for the whole trade.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Basis of Co-Partnership.

Sir,—Mr. Hunt's protest against departing from the basis of co-partnership as advocated for so many years by the late Sir George Livesey is one I thoroughly endorse.

Over and over again he had to face the criticism: "Oh, yes, Mr. Livesey, this profit-sharing scheme of yours is all very well as long as there are any profits. So long will your men stick to you; but they will fall away quickly enough when there are no profits to share." Yet it is certain Sir George's mature judgment would never have approved the departure Mr. Hunt criticizes; indeed, I feel he would have considered it as contrary to what he had so consistently advocated, which was to mutually share the profits of prosperity, and mutually bear the hardships of adversity.

Are the present times those of prosperity or adversity to gas undertakings? There can be but one answer; and so long as that holds there can be no justification for taking money from the already hard-hit gas consumers, or the heavily suffering gas shareholders in order to increase by one penny of co-partnership bonus the standard rates of wages which the gas employees are presumably receiving. To do otherwise would not be co-partnership as Livesey preached and practised it; and I earnestly hope that, despite the trials through which the industry is now passing, co-partnership gas undertakings will think twice before they depart from those fundamental principles which have stood the test of over seven-and-twenty years.

Charles Carpenter.

South Metropolitan Gas Company, April 2, 1918.

Sir,—Mr. Milne Watson's letter, although interesting, is not an answer to my criticism that the new scheme reduces to almost a minimum the incentive to further exertion.

Chas. Hunt.

17, *Victoria Street, S.W., April* 6, 1918.

Lighting, Heating, and Power Order, 1918.

Sir,—In view of the fact that the Board of Trade, in distributing this order throughout the gas industry, have requested gas undertakings to acquaint their consumers with the terms and conditions of the order, and at the same time provide suggestions for effecting economies to secure the necessary reduction in the consumption of gas, will you please allow me the opportunity of informing your readers that the B.C.G.A. is preparing literature for the use of gas undertakings in the area affected by the order. Samples, with particulars of prices, will be forwarded on application.

W. M. Mason, Secretary.

British Commercial Gas Association,
47, *Victoria Street, Westminster, S.W.*1, *April* 8, 1918.

The Importance of Coal Gas in Wartime.

Sir,—If the whole of the coal mines in this country stopped working for about six weeks, we should have to "throw up the sponge" as regards the war, and so would our Allies. Such is the power of coal. Very few people properly realize this fact. Beyond a little wind and water power, nothing else is responsible, except coal, for all mechanical movements and artificial heat. Fortunately, our coal measures, on the whole, are the best in the world as regards quality; but it is to be regretted that the quality during wartime has been seriously interfered with, and a very considerable waste of power, labour, and transport has taken place—as has already been abundantly shown in a recent issue of the "Journal" [March 12, p. 498].

The Coal Controller's action in calling the attention of the miners and coalowners to the seriousness of the case, is already having a beneficial effect; but much remains yet to advance the quality to that of the pre-war, although in pre-war times a great deal more could have been accomplished in regard to cleansing the coal. But now is the time, when our enemies are in a desperately bad internal condition, to bring the full force of the power which can be obtained from coal against the foe and smash him. To wait will only give him time to sow and reap in his ill-gotten possessions, and to gather vital minerals from the same sources. We must be quick. Time is of great importance.

Coal of the most suitable quality should only be supplied to those who can use it as a means of defeating the enemy. All other coal supplies should be stopped *at once*, in order that the essential users should have *adequate* supplies. Large quantities of coal are being wrongfully supplied to those who do not need it in wartime—namely, the non-essential industries. Nor should, from now until the autumn, householders have any coal supplied, except in some few necessary cases, as it is most important that from now stocks of coal should be accumulated by the light, heat, and power undertakings, in order to ensure an adequate margin of safety for next winter's working, as well as to mend the present depleted stocks which are, due to recent changes in method of transport, in many instances at a dangerously low ebb, and are likely to fail altogether unless the Coal Mines Department tackle the matter with a better wartime effort.

The horrors of uncooked food where gas or electricity is the only means available of cooking, and absence of artificial light, would have serious and far-reaching consequence, and might easily lead to riots. There is quite an easy method to obviate such a disaster, and provide all essential industries at once with a plentiful supply of coal. The machinery fortunately exists, and should be made use of at once. There are thousands of railway wagons and hundreds of engines and barges in use for the household coal supplies, as well as the necessary means of delivery from the railways, docks, and waterways. These could all be turned to excellent account, and at once.

At the present time, most coal-cellars are replete with coal, and many are being crammed as full as possible, so that the penalties in regard to the restrictions of gas and electric supply may be avoided. In regard to gas, this is an utter mistake, as I shall make clear presently. The horses, vans, and mechanical road transport can be used to convey coal (gas, steam, or household) to the essential works. The railway coal wagons and barges (private or otherwise) should be commandeered to assist the essential works. Owing to the slackness of the household coal trade, coal wagons remain weeks at a time on the railway sidings, waiting until house coal orders are received; whereas they could be, during that time of idleness, running several journeys between the coalfields and the nearest point to the essential works.

The Northern pitmen are now idle more than half their time, because many steam-colliers have been diverted to even more vital work; and it would be of great benefit to give them coal-wagons to fill. Practically without exception all the collieries are in a position to cope with the filling of coal-wagons; and, moreover, the work would be very welcome. Nor need there be any apprehension that the mines from which the household coal is won would be adversely affected, as there is such a demand for coal at essential industries that with the household coal-wagons running more journeys, they are likely to be kept busier than at present. Most of the household varieties of coal are both washed and screened. They are of better value than the unscreened varieties largely used by essential industries, and still in a dirty state. The household coal trade equipment would, moreover, be of an exceptionally useful character at the present moment, as, owing to the lack of tips at the docks and wharves, the road transport can take their places. If only the Department can be prevailed upon to manage the rail coal deliveries as admirably as the limited number of coasting colliers were managed, there will be little if any complaint. But it is three or four weeks ago since a number of coasting colliers were diverted to other work, and comparatively few tons of coal have reached the South by rail. The arrangements for rail coal deliveries to gas-works require to be hastened, and in the manner already described.

Which industries make the finest use of coal in war (or at any other) time? Undoubtedly, the gas and coke-oven industries. When coal is only burnt at industries, what are the results? Three only—heat, power, and ashes. Usually, a considerable percentage of the heat is wasted. With the gas and coke-oven industries coal is separated into hundreds of different materials, each of which can, as it were, be placed in a bin and supplied to the hundreds of different trades requiring them. There is hardly a trade which can be mentioned that does not use some product or bye-product from the distillation of coal. Practically every war industry requires a product from a gas-works or a coke-oven works, from steel-making to aeroplanes. Food production is now very largely dependent on coal distillation, as also is explosive material. In fact, if our gas-works and coke-oven works were suddenly put out of action, the war would be lost. On the other hand, if there were sufficient gas-works and coke-oven works, there would be absolutely no need for a single industry or household to burn raw coal. Everything required in regard to heat, light, and power could be supplied by gas and coke; and beyond this, there would be the hundreds of bye-products. If all the normal output of coal was subjected to distillation, there would be no need to import petrol, as benzol could be used as a more powerful substitute, and there could be ample for normal consumption if on the average only 1 gallon of benzol was extracted from each of the 260,000,000 tons of coal raised annually. Some of the coal is non-bituminous; and some of the bituminous steam coal contains a very large percentage of carbon. Yet the remaining coal is so rich in benzol that it would be a comparatively easy matter to extract from it up to 2 gallons of benzol per ton, and thus obtain an ample supply of motor spirit. The distillation of coal has now to provide a considerable proportion of the fuel oil used in the Navy; but if the whole of the coal raised annually and that is suitable for distillation was distilled, the whole of the oil required for the Navy could easily be provided, as well as large quantities for industrial works. But, as a matter of fact, the coal subjected to distillation is only about 18 p.ct. of the whole of the coal annually consumed in this country; and yet the fate of this nation and several of its Allies hangs on this 18 p.ct.

Is it not folly, then, to curtail the coal requirements of the gas industry by rationing gas and, moreover, compelling many gas-works to supplement the coal gas by adding large percentages of "blue" gas made from coke and steam? Every gas-works which can possibly do so should be compelled to make as nearly as possible 100 p.ct. of *good rich* coal gas, in order to safeguard the nation by forming hundreds of useful products.

The rationing of coal to gas-works I regard as a very grave error of judgment on the part of the Government. I quite agree that gas should not be wasted; but all essential gas should be made as much as possible from coal, and not from coke and steam, as the coke used is depriving other industries of a valuable substitute for coal. Moreover, the mixed gases are weaker than coal gas, and lessen the output of war industries to a considerable extent.

Why are non-essential industries and households allowed to use coal which by right in wartime should belong to gas-works? Coal gas undoubtedly should be used as a substitute for coal in industries and households, so as to provide the nation at war with as large a quantity of the hundreds of useful products from gas-works essential for carrying on the war to a successful issue.

The present rationing of coal to gas-works is a gigantic mistake for which we may have to pay dearly; it is absolutely and diametrically opposed to economy in wartime. The sooner the industry is allowed to manufacture as nearly as possible 100 p.ct. of *good rich* coal gas, so much the sooner will the war be won.

"Cricket."

April 8, 1918.

Coal and Gas Rationing.

Sir,—I am entirely in agreement with that portion of your leading article, in the issue of the 2nd inst., dealing with the above, in which you express the opinion that the recent plan of reduction is altogether unworkable.

Without attempting to criticize it, beyond offering a general ex-

pression as to it being unsatisfactory, I suggest that it would have been much better if the Board of Trade, in their desire to restrict the use of coal—as well as to ease transport—had made an order restricting the quantity of coal to all gas and electricity undertakings by 10 p.ct. on the 1917 or 1916 basis, whichever was the higher. Then gas undertakings who are responsible for supplying the public within the limits of their respective areas would have "cut their coats according to their cloth"—in other words, arranged the supply of gas to the public according to the quantity they have for disposal, just as in the same way that tradespeople are doing to-day in supplying other commodities. Some districts would have a supply more than others, not only because of the absence of carburetted water-gas plants, but carbonizing is more efficient in some gas-works than in others.

I urge that this question should be at once considered by the National Gas Council, and a deputation sent to the Board of Trade, with a view to the scheme being amended, somewhat on the lines which you have suggested. Otherwise, with depleted staffs, I cannot see how it will be possible to work the present arrangement successfully.

April 4, 1918. SOUTHERN COUNTY UNDERTAKING.

SIR,—We have now had time to read, mark, learn, and inwardly digest the famous new order enforcing economy in the use of gas and electricity; and the more it is studied the more ill-conceived and unworkable does it appear to be.

Its ostensible object is the saving of coal consumption and railway transport. As a matter of fact, those members of the public who have been duly impressed by it are, in the large majority of instances, announcing their intention of meeting the situation by discarding the use of gas for cooking and using coal instead; and orders are actually being placed with builders and others for the installation of coal-consuming apparatus. As kitchen ranges are notorious coal wasters, and are moreover, in these enlightened days, not in general use in the summer months, where is saving in coal and transport coming in?

If the Coal Controller is really anxious to effect a saving in coal consumption and transport, why is the large and promising field of house coal being left untouched? A very great economy could be realized here, far greater than anything that can be achieved by the cutting-down of gas and electricity; and it has the merit of being a saving at the expense of a consumption of coal which, from the National point of view, is entirely wasted. In Holland, I understand, the public are restricted to one coal fire per house—a very practical scheme of coal economy.

We have had published appeals for economy in the use of gas and electricity, followed by the order for compulsory enforcement of same. But I have looked in vain for a published appeal to the public for economy in the use of coal in the household. We have had unofficial hints and suggestions in the papers of a coming rationing of coal for domestic use; but up to the present there has been no order published with regard to it, and no sign thereof. One is tempted to inquire, why this tender regard for the house coal consumption?

I do not know what may be the position of national stocks of munitions of war, antiseptics, tar oil fuels, fertilizers, &c.; but at the present time a tremendous battle is raging in which we have lost a vast quantity of stores, and are using a vaster quantity daily. It will surprise few of us to receive at an early date an urgent demand from the Ministry of Munitions for the production of more of the above commodities. The question will then arise, How is it going to be done when the Coal Controller has cut-down the gas-coal supply, and driven the public from the use of gas? The public are getting very tired of the continual issue of contradictory orders from Government Controllers in London, and are not going to be content to be blown hither and thither by every wind from that quarter.

At a recent meeting of the Southern Association of Gas Managers, I stated that the position with regard to the supply of house coal was a scandal. I see no reason to alter that view to-day—indeed, I regard it as a grave scandal. In face of the announcement by the Coal Controller as to the necessity for diminishing coal consumption and transport, we have the fact that coal is being pelted in to every quarter for domestic supply in the most lavish manner. There is no difficulty, certainly outside the London area, in purchasing any quantity of house coal; the only limits being the means and accommodation of the individual. This is no doubt a very satisfactory and comforting state of affairs for the coal trade. As one important member of it remarked to me with candour and cynicism: "There is more profit in house coal than we get from you gas and electricity people." Very likely! But whether it is in the national interest is another, and a very serious, question.

I am glad to observe that the Public Press is awakening to the absurdities of the Coal Controller's Department. The present anomalous condition of things—the transfer of coal from the gas-works to the domestic fire-grate, and the ever-increasing deterioration in the quality of coal—cannot continue.

We are all of us willing to do anything, and suffer any inconvenience which may be necessary, to assist in winning the war; but it is difficult to see in what way the recent order is of service to the nation, or any part of it, except the coal trade interest.

A couple of women, managing an ordinary household, would have put to shame in ten minutes the officials whose ignorance of domestic management is on a level with their knowledge of real economy.

The above words are not mine, but those of the leader writer in the "Weekly Dispatch," and are a criticism on the Coal Control Department, under the heading "The Gas Muddle." They are strong; but I think most of us will subscribe to their aptness.

Finally, I would like to ask, what are those terribly inert bodies the National Gas Council and the Council of the Institution of Gas Engineers doing in the protection of the great gas industry? In comparison, Rip Van Winkle would appear to be a very lively individual. Possibly some day they may stretch themselves, yawn, and awaken, but at present an occasional academic discussion seems to be the limit of their capabilities.

SIDNEY O. STEPHENSON.

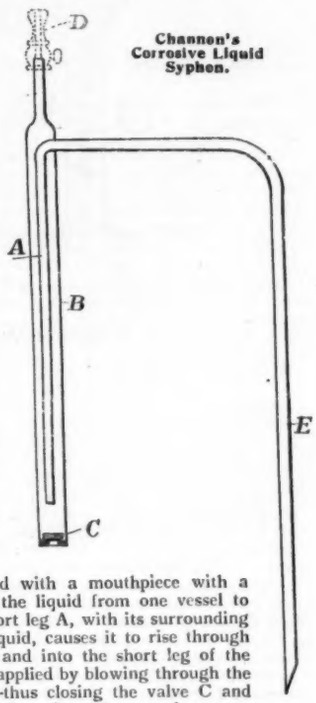
Worthing, April 6, 1918.

REGISTER OF PATENTS.

Syphons for Corrosive Liquids.—No. 112,188.

CHANNON, P. J., of Eastriggs, N.B.

No. 2160; Feb. 13, 1917.



Channon's Corrosive Liquid Syphon.

This invention relates to syphons in which the short leg is enclosed in an outer chamber adapted to be inserted in the liquid to be transferred, and from which outer chamber liquid can be forced by pressure applied to its constricted upper end, up the short leg of the syphon, and over the bend to start the syphon action—the lower portion of the outer chamber being provided with an inwardly opening single-way valve. The arrangement is said to be particularly applicable for emptying acid tanks, carboys, sulphate of ammonia saturators, and the like.

The short leg A of the syphon pipe is enclosed in a cylinder or pipe B, extending above the bend of the syphon pipe and below the lower end of the short leg. The surrounding cylinder is fitted at its lower end with a non-return valve C—say, a disc valve (as shown) with valve-guides if required. The upper end is constricted and provided with a mouthpiece with a cock D. In order to transfer the liquid from one vessel to another at a lower level, the short leg A, with its surrounding cylinder, when placed in the liquid, causes it to rise through the valve into the cylinder B, and into the short leg of the syphon pipe. Pressure is then applied by blowing through the mouthpiece at the upper end—thus closing the valve C and forcing the liquid which has risen into the annular space formed between the interior of the cylinder and the short leg of the syphon into the syphon pipe, and causing it to overflow into the longer leg E, and consequently starting the syphon action.

Screening Coal or Coke.—No. 113,693.

ALDRIDGE, J. G. W., RANKEN, A. W., and CLARE, T. A., of Victoria Street, Westminster.

No. 4064; March 20, 1917.

In a practical form of this invention the screen, inclined at an angle to the horizontal, is suspended by links below an opening in a shoot down which the material is fed and reciprocated by suitable means. Spaced bars fixed to side supports of channel iron extend across the underside of the screen, and carry teeth or fingers—a row to each bar, while the number of fingers in each row corresponds to the number of spaces in the screen.

Burners for Blast-Furnace Stoves.—No. 113,740.

SUGIMOTO, S., of Honkeiko, South Manchuria.

No. 11,032; July 31, 1917.

In his specification, the patentee says: Blast-furnace stoves are frequently heated by air-gas burners which are generally provided with an axial movement for withdrawing the burner from the stove at the end of the heating period, and with a rotary movement about a vertical axis for turning aside the withdrawn burner when access is to be had to the gas-port of the stove. The ball or roller bearings which facilitate these movements are generally constructed on the walls of the gas-flue on which the burner is supported, and several devices have been used for preventing any escape of gas through the bearings while the burner is in operation.

The main feature of novelty in the burner constructed according to this invention consists of screw-threaded gas sealing rings for preventing any escape of gas through the bearings. Such a construction permits sufficient variation in the supply of gas and air to ensure the proper proportion of air to gas when the conditions in the stove (chiefly the capacity of the chequer-flues as determined by deposition of dust) vary.

Gas-Generators.—No. 113,856.

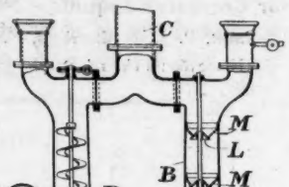
WOLLASTON, T. R., of Manchester.

No. 3962; March 19, 1917.

This invention relates to apparatus for generating gas from coal or other carbonaceous material and particularly (though not essentially) to apparatus the gas from which is subsequently dealt with for the extraction of bye-products—as, for example, tar, spirit, oils, and ammonia.

The inventor employs a producer of ordinary type, but preferably as described in patents No. 12,400 of 1914 and No. 3963 of 1917, but which has mounted upon its crown tubes or retorts (vertical or other-

wise) of considerable height, and slightly conical or tapered. Near the top of the retorts outlet branch pipes are provided to conduct the gas to a collecting main, and each retort is fitted at the top with a sealing charging hopper of the ordinary type.



Wollaston's Gas-Generator.

A longitudinal section is given of the upper part of the producer, above which are a pair of retorts containing the controlling mechanism; also a cross section of the left-hand retort.

A is the upper part of the producer, and B are retorts mounted on it, with fuel hoppers above provided with controlling valves. An outlet for the gas is shown at C. Within each retort means are provided for distributing the fuel and regulating the velocity of the gas passing. In the left-hand retort shown, these consist of a worm or helical member having perforated vanes. The extent to which the vanes are perforated may be varied at different levels. The helix is rotated by being mounted upon a vertical shaft operated through a wheel and worm above. In the right-hand retort perforated cones L are mounted upon a vertical shaft, assumed to be capable of a down and up motion by being operated through gearing. The cones pass within fixed inverted cones M (also perforated) attached to the wall of the retort. These, again, may be varied in degree of perforation at different levels. The retorts are slightly conical or taper in form.

In operation, fuel supplied from the hoppers, in passing down the retorts, is distributed by the controlling means within them, so as to keep the fuel in a more or less open condition. The gas from the producer, having only this means of exit, makes its way through the fuel in the retorts, and distils it; so that it reaches the producer in a coked or semi-coked condition. At the same time, the producer gas, in passing through the fuel, "gains in calorific value by taking up various hydrocarbons gases released." The loss of temperature attending this process, it is said, "largely obviates the necessity of additional means for cooling the gas subsequently, as are commonly applied in the case of power gas producers."

Thus, as an example, the average temperature of the gas on entering the lower end of a retort may be as much as 500° C., but may be reduced to 200° at the upper end of the retort—a reduction of temperature which may ordinarily result in condensed distillates tending to flow back into the producer, in which case, controlling means provided in the retorts, according to the invention, tend to prevent this by providing increased velocity of the outgoing gas. On the other hand, the controlling means operate to keep the fuel in an open condition, and facilitate its passage towards the producer.

Gas Washer-Scrubbers.—No. 113,937.

Thuman, F.; a communication from J. A. P. Crisfield, of Philadelphia, U.S.A.

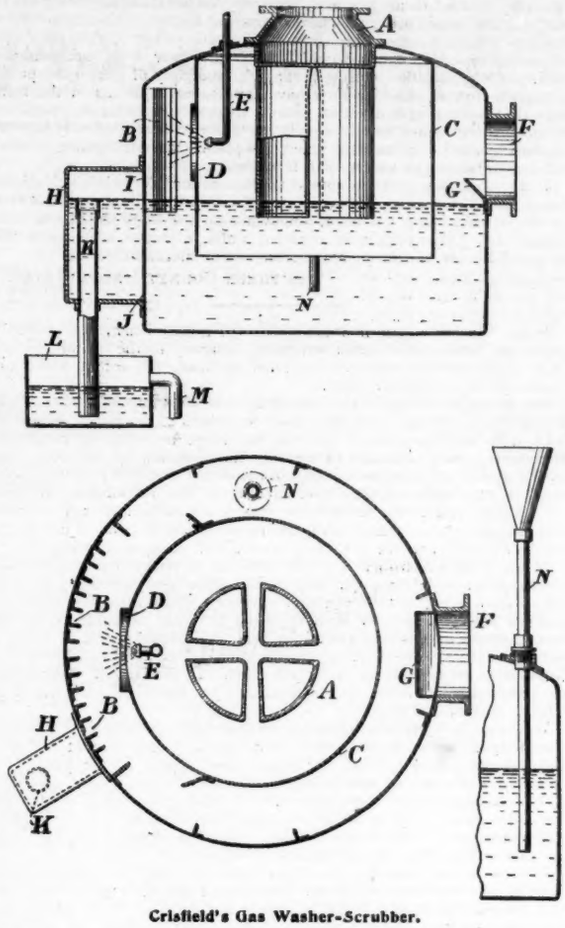
No. 16,744; Nov. 14, 1917.

The inventor proposes, "first, to provide compact, comparatively inexpensive, and efficient apparatus for both cooling and scrubbing gas, and, second, to provide a combination of parts, constituting a single piece of relatively small apparatus, and adapted more efficiently to perform the functions than relatively large separate cooling and scrubbing appliances—thus saving room or space while obtaining the advantages previously mentioned."

Generally stated, the invention consists in subdividing the interior of the casing of a hydraulic valve into two chambers communicating with each other, and providing a mechanical scrubbing surface confronting the communication between the chambers and a liquid spraying device for cooling the gas mixture prior to its impingement upon the scrubbing surface.

A sectional elevation and a horizontal section are given; also an elevation, partly in section, illustrating a detail of construction.

The casing is provided with a gas-inlet dip-pipe A, adapted to contain a sealing liquid. The pipe is shown as divided; but this is not essential. B is a stationary mechanical scrubbing surface, consisting of a series of angle-shape parallel bars projecting from the interior of the casing. C is a partition subdividing the interior, and dipping into the liquid in the casing sufficiently to prevent gas passing under normal operating conditions. D is an opening communicating between the inner and outer chambers, and confronting the scrubbing surface B. E is a scrubbing-jet arranged in proximity to the opening D and the scrubbing surface. F is an off-take communicating with the outer chamber and opposite the scrubbing surface B. G is a splash-plate for preventing the accidental escape of liquid through the off-take F. H is an extension of the casing, and it communicates with it by means of the upper and lower openings I J. K L M constitute an overflow for maintaining an appropriate liquid level in the casing and the extension H. Baffle-plates are arranged in the outer chamber of the casing and disposed in the line of travel of the gas. N is a device for introducing liquid into the casing.



Crisfield's Gas Washer-Scrubber.

In use, the gas is confined and discharged at relatively high velocity upon the mechanical scrubbing surface B in order to remove entrained matter; and the liquid spray E cools the entire outgoing stream of crude gas mixture prior to its impingement upon the mechanical scrubbing surface; the gas being discharged normally upon, or perpendicular to, its corrugated or ribbed surface. Thus the entire stream of gas is both cooled and scrubbed or washed in a single piece of apparatus, as the relative positions of the gas inlet and outlet and the employment of the baffle-plates "afford a very lengthy and efficient contact of the gas with the external cooling surface of the casing."

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 4.]

Nos. 5185—5571.

Ashcroft, E. A.—"Carbonization of coal or distillation and cracking of shales, peat, cils, pitches, &c." No. 5502.
Barrow, A. G.—"Gas-heated water-boiler with cooking steamer attachment." No. 5531.
Beard, G. F. H.—"Means of support for cups and dips of telescopic gasholders." No. 5441.
Cahill, P. J.—"Shock-absorbing device applicable to gas-mantle fittings, &c." No. 5542.
Dale, Brown, & Co.—"Gas-producers." No. 5333.
Davy, J. F.—"Taps for water-heaters." No. 5563.
Dempster, R. & J.—"Spark, dust, and cinder arresters for chimneys." No. 5440.
Dempster, R. & J.—See Beard. No. 5441.
Helps, G.—"Gas manufacture." No. 5526.
Jackson Boilers, Ltd.—"Gas-heated water-boiler." No. 5531.
Knight, H. S.—See Dempster. No. 5440.
Lamplough, F.—"Distillation of coal." No. 5511.
Lewis, W. I. G.—"Gas-heaters." No. 5275.
Newall, J. C.—See Dale, Brown. No. 5333.
Oil Extractors, Ltd.—See Lamplough. No. 5511.
Schmidt, K.—"Smelting-furnace heated by oil or gas." No. 5227.
Taylor, T.—See Lewis. No. 5275.
Yates, H. J.—See Davy. No. 5563.

The Bingley Gas Committee were authorized, at a meeting of the District Council recently, to visit the works and decide what to do with the retort-bench; alterations in contemplation being likely to cost about £2000. In regard to the condition of the works, it was explained that the Special Committee had reported to the General Committee; but the latter did not feel inclined to take definite steps until the new Manager had arrived.

MISCELLANEOUS NEWS.

COAL ECONOMY—IMMEDIATE AND FUTURE.

Writing in the April issue of the "Bulletin of the British Commercial Gas Association," the Executive Chairman points out that, for the conservation of coal, of transport, and of labour, it is essential that the nation should use gas and coke instead of coal, and should never use electric energy for heating (as distinct from lighting or power) purposes. These assertions are, he goes on to say, founded upon the following calculations, based on experience or on accepted data.

In actual B.Th.U. obtainable by complete combustion:

1000 c.ft. of coal gas = 40 lbs. of coal or coke.

In effective heat obtainable in practice:

For continuous heating (say, for six hours or more)—1000 c.ft. of coal gas=1 cwt. of coal or 90 lbs. of coke.
For intermittent heating—1000 c.ft. of coal gas=2 cwt. of coal or 180 lbs. of coke.

Consequently:

For continuous heating—3 million c.ft. of gas in effective work = 150 tons of coal.
For intermittent heating—3 million c.ft. of gas in effective work = 300 tons of coal.
For its production—3 million c.ft. of gas entails the carbonization of 250 tons of coal; but there will remain for sale 125 tons of coke, equal in effective work to 150 tons of coal.

So that by the use of gas and coke a net consumption of 100 tons of coal will do the effective work of from 150 to 300 tons of coal burnt in the crude state, according to whether the work be more or less continuous—say, an average of 200 tons; and, moreover, there will remain, if the coal goes to the gas-works, valuable residuals of tar and ammonia, and their bye-products, which are lost if the coal be burnt in crude form in a grate or under a furnace or for generating electric energy.

The haulage comparison stands as follows:

	By Rail or Sea. Tons.	By Cartage in Town. Tons.
Crude coal—		
To do the work of gas	200	200
To do the work of coke	150	150
	350	350
Total.	700	
Gas and coke—		
For carbonization	250	—
Coke	—	125
Total.	375	
Saving if gas and coke are used	100	225
Total.	325	

The saving in labour, in addition to that saved in haulage, is obvious, as the labour employed in modern retort-houses is exceedingly low per ton as compared with stokers in small boiler-houses, &c.

If the coal were converted into electric energy, 100 tons would produce in the most efficient modern plants 90,000 units, of which not more than 75,000 units would be available at the consumers' heating or cooking appliances. The total heat equivalent of 75,000 units of electrical energy would not more than equal the useful work of 1 million c.ft. of coal gas; and it would be within the mark to say that in a modern generating station 400 tons of coal would have to be converted into electric energy (with the loss of all residuals) to provide the same useful heat that would be provided by 100 tons of net coal consumption if gas were used as the heating agency instead.

How do the comparisons work out in cost to the consumer, who, if the desirable revolution in his fuel habits is to be effected, has got to be persuaded that it is to his advantage, as well as to that of the community (in smoke abatement) and of the nation (in conservation of transport, labour, and natural fuel resources)? What would be the comparative cost to him of equal amounts of effective heat if he employed (*a*) coal, (*b*) gas, or (*c*) electricity?

Taking pre-war average prices to the domestic consumer, the gross approximate cost for fuel may be put as follows:

Coal—150 to 300 tons, at 25s.	£187 to £375
Gas—3000 thousands, at 2s. 6d.	£375
Electricity—300,000 units, at 1d.	£1250

Taking the Greater London area as an illustration, it is known that less than 5 million tons out of the 16 million tons of coal brought into the area are destined for the gas-works. If nothing but gas or coke were used in the area where coal is now used, the output of the gas-works would be increased by 150 p.ct., the actual quantity of coal brought from the mines would be reduced by about 4 million tons, and London would be a smokeless city.

EDINBURGH GAS-WORKERS' WAGES.

In the "Journal" of the 19th ult. [p. 559], it was reported that the Edinburgh gas workers were agitating for a further bonus of 3s. per week (making it 20s.), *plus* 12½ p.ct. on their wages and bonus.

As the Corporations of Edinburgh and Leith had received similar demands in respect of certain of their employees, a meeting of the various representatives (including those of the National Union of Corporation Workers) was held at the Gas Commissioners' Offices last Tuesday—Prof. Baillie (London), of the Chief Industrial Commissioners' Department, acting as a Neutral Chairman. After a very lengthy discussion, an adjournment took place until the evening; and at a late hour an agreement was arrived at and signed by the parties concerned. The male employees over 18 years of age of the Gas Commissioners are to receive such further advances as will produce 18s. 6d. over the pre-war weekly wage for an ordinary week, and, in addition, the 12½ p.ct. bonus on their earnings. The male employees in the Electric Lighting Department of the Edinburgh Corporation over 18 years of age are also to have their bonus increased to 18s. 6d. per week, and are to continue to receive the 12½ p.ct. bonus on their earnings, which was granted some time ago. Boys and women are to get half of the additional advance mentioned, excluding the 12½ p.ct. bonus. The increases are to take effect as from May 1 next, and to continue for four months.

METROPOLITAN GAS COMPANY OF MELBOURNE.

The Half-Yearly Meeting of the Company was held at the Offices in Melbourne on Jan. 26—Sir John Grice (the Chairman) presiding.

The Chairman, in moving the adoption of the report and accounts, said that during the year ended Dec. 31 there was sold 3223 million c.ft. of gas, as compared with 3206 million c.ft. in 1916. The reason for this small increase would be understood when it was remembered that the strike of coal miners in New South Wales and seamen, which commenced early in August, was not settled until the end of October. The Commonwealth Government, on Sept. 25, under the War Precautions Act, placed restrictions on the use of gas for domestic and industrial purposes; and these were not removed until Nov. 3—a period of nearly six weeks, during which time decreases in the daily output of gas were experienced. Comparing the figures in the half-year's balance-sheet with the corresponding period of 1916, the revenue from the sales of gas amounted to £366,928, as against £356,158—an increase of £10,770. Residuals showed an increase of £15,289, having brought in a total of £105,294, as compared with £90,005. The total revenue was £26,059 in excess of the same period of 1916. The balance to the net revenue account was £19,511 less than twelve months ago; this being accounted for by the greater cost of coal. This increased cost was partially due to the recent strike at the mines; and, in addition, they had had, from Jan. 1, 1917, to pay 3s. per ton extra, which was imposed by the Special Coal Tribunal appointed by the Government to settle the coal-miners' strike at Newcastle at the end of 1916. The expenditure on repairs would continue to be heavy for some time to come; the amount spent in this direction for the half year having been £52,615. The work of repairing the million c.ft. gasholder at the South Melbourne works had been completed, and a commencement made on the reconstruction of the holder at West Melbourne. In addition, a 200,000 c.ft. holder at the Fitzroy works had been dismantled; and the one at present situated on St. Kilda Road is to be re-erected on this site. During the six months, 1¾ miles of mains and 35½ miles of services had been laid, as compared with 13½ miles of mains and 49½ miles of services during the corresponding period of 1916. The profits for the half year had been dealt with as follows: Transferred to meter renewal account, £3000; transferred to gas-stoves account, £5000; transferred for replacement of carbonizing plant at the West Melbourne works, £10,000; and the Board recommended a dividend of 6s. 6d. per share, absorbing £62,218. This would leave a balance to be added to the carry-forward of £5807. The first installation of Woodall-Duckham continuous vertical retorts, which was erected in 1915 at the West Melbourne works, continued to give very satisfactory results. The second installation on this system at the same works was now practically completed, and would shortly be put into action. This latter plant had a nominal manufacturing capacity of 2 million c.ft. per day. Contracts had also been entered into locally for a third installation of a similar capacity, the construction of which was about to be commenced. The actual manufacturing capacity of the West Melbourne works, however, would, when this proposed carbonizing plant had been erected, only be increased by about 1 million c.ft. per day. This was by reason of the fact that the Dessau intermittent vertical retort unit, with a nominal capacity of 3 million c.ft. per day, erected some years ago, was, in the opinion of the Engineer, becoming economically incapable of further carbonizing operations. The Directors experienced considerable anxiety and difficulty in carrying on the operations of the Company during the half year. During the suspension of supplies from Newcastle, the coal stocks became gradually exhausted; but, owing to the excellent management of the Coal Board, they were enabled to obtain just sufficient from coal stocks held in Victoria to carry on the limited service imposed under the War Precautions Regulations. The greater part of the coal secured was, however, of a distinctly inferior character for gas making. Its cost, too, ranged as high as 60 p.ct. over former prices. Under these conditions, it was found impossible to maintain the ordinary pressures to consumers. The Directors would like to express, on behalf of the shareholders, their great appreciation of the loyalty of the whole of the staff, and of those workmen who showed an intention of standing by the Company during an anxious time.

The report was adopted; and a dividend at the rate of 6s. 6d. a share was declared.

THE TAXATION OF COAL MINES

The paper on the "Taxation, Rating, and Valuation of Mines," which was recently read by Captain David Bowen, F.G.S., M.I.M.E., at the Surveyors' Institution [see "Journal" for March 12, p. 512], has elicited some interesting views from several well-known mining surveyors, which they have communicated to Mr. Alexander Goddard (the Secretary of the Institution).

Sir Francis Brain considered that mines were most unfairly treated under the present taxation law. That the owner of a mine who was daily exhausting the *corpus* of his property should have no allowance made for capital exhaustion was, he ventured to think, most inequitable.

Mr. Thomas H. Bailey (Birmingham) remarked that there was a certain amount of amusement, seasoned with alarm, in referring to

tables used by his late father, Mr. Samuel Bailey, to find that income-tax tables stopped at the rate of 7d. in the pound. This afforded an instance of the great difference between the problem of the paper as it is to-day and as it was not so very long ago. As long back as 1870 his father settled the assessment of collieries on the basis of a sliding-scale dependent upon the selling price and output of the colliery for the time being, subject to the deductions demanded by special circumstances; and he believed he was one of the first to adopt this method. When Captain Bowen came to deal with the question of valuation of mineral property, he would be grateful if he would give his views on the best method of taking into consideration the important changes in the money market of late years, and particularly in consequence of the war, and the fact that a high rate of interest on investments would be the rule for many years to come. He asked: Was it not time that a stereotyped "3 p.ct." rate for reinvestment to replace capital should be increased? And was it to be regarded as wise or accurate to calculate the security or speculative nature of a mineral property on a flat-rate for the full term?

Mr. Arthur Hassam (Newcastle, Staffs) said his experience strongly supported the view that the most equitable arrangement in regard to the rating of collieries and ironstone mines, and works of such like character, was based upon the tonnage system of treating the whole of the plant and machinery, buildings, sidings, &c., as appurtenances, covered by the basis tonnage rate. Under this system, appurtenances would include only such plant at the colliery as would be requisite to put the produce on the market, properly separated and cleaned. It would not, of course, include properties which might appear to be almost adjuncts at some collieries, such as coke-ovens, bye-product plant, &c., which should always be regarded as separate hereditaments. Although this method largely simplified and tended to render uniform the practice of assessing mines, it was not without its difficulties in arriving at the tonnage, unless the output was taken purely as weighed over the pit-bank machine. If, on the other hand, the tonnage of saleable produce was taken as the basis, the calculation became complicated by numerous deductions for fuel, refuse by washing plants, screens, &c. But, on the whole, whichever of these two methods was adopted, there was no doubt the tonnage system worked out with the greatest satisfaction, and gave a greater sense of equitable dealing to the occupiers. He was strongly of opinion that the tonnage principle was equally sound if applied to coke-ovens, iron-works, &c.

Mr. W. M. Miller (Edinburgh) remarked that what seemed chiefly desirable as regarded both taxation and rating was that the wasting nature of the subject should be taken into account. Public bodies frequently issued loans repayable in so many half-yearly or yearly instalments, a proportion of which was calculated, if invested, to recoup the lender the amount of his loan by the time the payments ceased. This portion of the payments was not treated as income, and was not subject to income-tax. It seemed only reasonable that royalties and lessee's profits should be dealt with in a similar way before the amount to be assessed for either taxes or rates was arrived at. An example as to what proportion of royalties might reasonably be considered as income was to be found in the method adopted in dealing with the Crown mineral estates, in the Crown Lands Act, which provided for only half the mineral revenue being treated as income.

DRYING SEWAGE SLUDGE BY GAS.

A Suggestion for Utilizing the Waste Heat from Gas-Retorts.

The following letter has been written by Mr. Edmund Kimber to the London County Council, on a matter in which he has been engaged, more or less for a great many years past. The letter offers a solution of a problem which the writer suggests will prove of great advantage both to the gas companies and the ratepayers of London. The letter is addressed to the Clerk (Mr. James Bird), and is dated March 22.

Referring to your letter of the 20th ult., in which you informed me that the sludge produced at the London outfalls was a liquid, and the Council possessed no appliances for dewatering and drying it, I have now, after a further examination of the whole subject, to submit to the Council the following proposition:

1.—To dewater or dry the sludge, which comes to 2,500,000 tons a year, would require 156,250 tons of coal, besides the expenses of the drying machinery. But I have found that a great deal more than 156,250 tons of calorific power is wasted by the London Gas Companies whose works are on the Thames and within easy access of the two sewage outfalls on the river. Their names and particulars of their carbonization are set out in the enclosed memorandum, from which you will see their waste heat is equivalent to 500,000 tons of coal per annum. Half of this would be more than sufficient to evaporate the whole of the 2,500,000 tons of sewage. It would be easy, therefore, to erect drying appliances close to these gas-retorts, and so deal with the whole of the sludge, which could be delivered to them by the present steamboats or sludge ships, with the exception of that for the Gas Light and Coke Company, amounting to half of the whole quantity, which could be treated on the works of the Council at Beckton, as their premises adjoin those of the Company.

2.—It would be worth the while of the London ratepayers to pay the Gas Companies £100,000 a year for their waste heat, as it would save them the cost of coals, which would come to five or six times this amount. There would be no difficulty in erecting the proper apparatus on or near the different companies' premises, where the sludge could easily be delivered from the sludge boats on the river; and it would be very advantageous for the Council to have no less than five different places from which the dry sludge could be delivered. If the sale did not go briskly, a great deal of it could easily be moved to the parks and open spaces of London, where the people at large could be instructed upon the proper use of it.

3.—As this is a much larger proposition to negotiate than that which

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I submitted to the Council in my letter of Jan. 4 last, my friends cannot at their own expense put down drying machinery in five different places, especially as it comes within the statutory duty of the Council to provide this; and, of course, it must be a cash transaction.

4.—I do not propose therefore that my friends should go further into the question of erecting the drying sheds and supplying and erecting the proper machinery, unless the Council agree in principle to this method of operation.

5.—If the Council are unable to come to any conclusion upon this, I would suggest to them that they should offer a premium to all mechanical and other engineers for designs for drying sheds and machinery to be erected at the different gas-works for the purpose of the evaporation, and that the prizes to be awarded for such designs should be £1000 for the first, £660 for the second, and £330 for the third. This being done, my friends would, if necessary, willingly take and deal with the whole of the dried sludge.

6.—You will have observed from the reports of the debates in Parliament and of the questions put to the Government upon the subject of fertilizers by different members, that this has become a pressing, if not a burning, question; and as it would considerably lighten eventually the burden upon the ratepayers, it is to be hoped that the Council will see their way to deal with the question without delay.

On a basis of a carbonization of 2,000,000 tons of coal per annum, of which 12½ p.ct. is wasted heat given off from gas-retorts, we have 250,000 tons of coal to evaporate 2,500,000 tons of sewage, or 1 ton of coal to 10 tons of sewage. But according to the best authorities, 1 lb. of coal will evaporate 16 lbs. of water. If all the waste heat could be saved and applied therefore, it would cost only 156,250 tons instead of 250,000 tons of coal.

	Tons a Year.
The Gas Light and Coke Company carbonize about	2,000,000
South Metropolitan Gas Company about	1,000,000
Commercial Gas Company about	300,000
Wandsworth and Wimbledon Gas Company about.	500,000
South Suburban Gas Company about	200,000
	4,000,000

12½ p.ct. of 4,000,000 = 500,000.

Supposing, therefore, the Gas Companies gave the London County Council only one-half their waste heat, it would be more than sufficient to evaporate the whole of the 2,500,000 tons of sludge.

Maryborough (Queensland) Gas Company.—The profits of the Company for the half year ended Dec. 31, after making provision for duty on bonus shares, bad debts, depreciation, working expenses, wear and tear, and other charges, including the balance brought forward, amounted to £1384. The payment of the usual dividend of 6 p.ct. per annum (free of income-tax) left £146 to be carried forward.

GAS SUPPLY CONDITIONS IN NEW YORK.

Annual Report of the Consolidated Gas Company.

The report of the New York Consolidated Gas Company for the year ended Dec. 31 shows a net income equal to $7·75 a share on the $99,816,500 capital stock, against $8·67 a share in 1916. The Company paid 7 p.ct. in 1917 and 1916, against 6¼ p.ct. in 1915.

It is estimated that the additional cost of producing and distributing gas and electricity, due to the increase in the price of labour and materials, amounted during the year to approximately $4,838,355. Notwithstanding some improvement in the revenue from the sale of residual products, credited to the cost of gas manufacture, the increase in the combined operating expenses of the Gas and Electric Companies amounted to $9,336,003, including the increase in taxes ($1,486,626) and the increase in operating expenses due to the greater quantity of gas and electricity sold ($2,413,332). The income account compares as follows:

	1917. $		1916. $
Operating income	2,538,279	..	3,217,512
Other income	6,695,957	..	6,930,108
Gross income	9,234,236	..	10,147,620
Interest	1,493,159	..	1,493,156
Net income	7,741,077	..	8,654,464
Dividends	6,987,155	..	6,987,155
Surplus for year	$753,922	..	$1,667,309

Beginning with Dec. 15, the low temperature, coupled with the extraordinarily severe weather conditions, created a demand upon the Company's manufacturing resources that was without parallel. On that date, the output was 129,959,000 c.ft.; on Dec. 28, it was 137,210,000 c.ft.; and on Dec. 31, 155,006,000 c.ft. The output for the last three days of December aggregated 460,613,000 c.ft.—an increase over the three corresponding days in 1916 of 134,297,000 c.ft., equal to 41·16 p.ct. The maximum day's output in December, 1917 (155,006,000 c.ft.), exceeded the maximum day's output prior to December, 1917 (125,148,000 c.ft.), by 29,858,000 c.ft., or 23·86 p.ct. This increase in the maximum day's output was equal to the entire manufacturing capacity of the largest plant in the system, outside of the Astoria plant, which has a rated daily capacity of 40,000,000 c.ft.

The scarcity of coal undoubtedly contributed largely to the increase in the output of gas, and created an extraordinary demand for room-heating appliances, the daily sales of which exceeded all previous records—more than 1400 appliances of this character having been sold in a single day. In five days, 5044 room-heating appliances were sold. During the year, the Consolidated Company and its affiliated gas com-

THE MAIN LINES

The No. 42 Cooker.

For All Times.

"D.S.O." Fire.

These are Safe Lines. *Write for Prices and Deliveries.*

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N. 18; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOWROOMS and BRANCHES: 25, PRINCES STREET, OXFORD CIRCUS, W. 1; 82, Gordon Street, GLASGOW; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

panies installed 205,074 appliances. There were surrendered to the Company 67,410; leaving a net increase of 137,664 in the number of appliances in use, which have been installed by the companies, as against the net increase in the previous year of 108,852, and in the years of 1915 and 1914 of 90,396 and 61,570 respectively. The net increase in 1917 included 2856 hotel and restaurant appliances, 3888 industrial appliances, 3197 gas-fired steam radiators, and 28,382 miscellaneous gas-heating appliances.

The growth of the use of gas instead of coal for cooking is noted in the increase of 33 p.ct. in the hotel ranges installed and the additional cooking appliances out on rental to consumers. Of the latter, there were 462,332 of various types out on Dec. 31—an increase of 13,521 over the number in use the year before.

The effect of the war on the cost of production and distribution has already been disastrous, and will be much greater during the present year than in 1917. The average increase in the price of all varieties of coal used amounted to 34·3 p.ct. The price of gas oil increased 66·2 p.ct., and has increased again this year 30 p.ct.; the increase in the price of gas oil in 1918 over that of 1916 amounting to 116·6 p.ct. The increase in the price of these items alone added $4,530,600 to the cost during the year 1917 of manufacturing gas and generating electricity.

It is expected that by the time the Government is ready to proceed with the recovery of toluol, the candle-power standard, which has been virtually abandoned throughout the world, will be repealed, and such calorific standard substituted as will permit the recovery of all of the toluol contained in the gas. The Massachusetts Board of Gas and Electric Light Commissioners recently prescribed 528 B.Th.U. as the proper standard; and stated that it would "permit the companies to recover for the Government the toluol and benzol, so imperatively needed." This standard was fixed after extensive practical tests, which demonstrated that a reduction in the British thermal units in the gas, even though considerable, really made no practical difference to the consumer, when the gas distributed was of a uniform and stable quality, and fixtures were properly adjusted.

The combined gas sales of the Consolidated Gas Company and its affiliated gas companies in the boroughs of Manhattan, the Bronx and Queens, and in Westchester county amounted to 1,407,202,100 c.ft. more in 1917 than in 1916—a gain of 4·79 p.ct., as compared with a gain of 4·01 p.ct. in 1916. The total number of gas-meters in use at the end of 1917 was 964,098, and of electric-meters 353,660. The combined sales of gas of the various companies during the year amounted to 30,778,670,800 c.ft.

There was expended during the year for additions to, and extensions of, the producing and distributing plants of the various gas and electric companies the sum of $5,200,455.22. At a cost of $4,924,834.82 for repairs and $1,500,893.03 for renewals, or a total of $6,425,727.85, all of these gas and electric properties have been maintained at the highest possible point of operating efficiency; thus insuring the best results as to the quality of the gas and electric service, as well as economy in the cost of production and distribution.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Ammonia.

London, *April* 6.

The price of pitch in the London market continues without change; but the number of boats offering at present for the export of this article is very limited. In dehydrated tar, a certain amount of business is being arranged for road work. Solvent naphtha is steady at from 4s. 3d. to 4s. 6d. per gallon net. Anthracene, 48-50 p.ct., is 6d. per unit net, casks included, at makers' works. Tar spirits and other products controlled by the Government are without change.

There is still a certain amount of inquiry for sulphate of ammonia; but there are no supplies available in the London district.

Tar Products in the Provinces.

April 8.

The average values for gas-works products during the week were: Gas-works coal tar, 28s. to 32s. Pitch, East Coast 20s. to 25s. per ton; West Coast—Manchester 18s. 6d. to 19s. 6d., Liverpool 19s. 6d. to 20s. 6d., Clyde 19s. 6d. to 20s. 6d., nominal. Benzol 90 p.ct., North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 7½d. to 8¼d. Solvent naphtha, naked, North, 3s. 10d. to 4s. Heavy naphtha, North, 2s. 3d. to 2s. 6d. Creosote, in bulk, North 4d. to 4½d. Heavy oils, in bulk, North 4½d. to 5d. Carbolic acid, 60 p.ct. East and West Coasts, 3s. 4d. naked. Naphthalene salts, 90s., bags included. Anthracene, "A" quality, 4d. to 6d. per unit; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

The conclusion of the Easter holidays has brought a slight increase in the volume of business passing in tar products. Pitch still exhibits an improving tendency, especially in Provincial centres. The season of heavy production has ended, and stocks are now, in most cases, no longer accumulating—indeed, in some cases a decline is taking place. Considerable delay is being caused to the export trade by lack of shipping facilities, and, unfortunately, there appears to be no likelihood of any improvement yet. London still remains the best shipping centre; and the quotation is firmly maintained at 50s. to 52s. 6d. per ton f.o.b. East Coast ports quote 31s. per ton. There is a continued demand for tar for road purposes. The naphthas are well maintained—solvent at 4s. 3d. and heavy at 3s. 3d. per gallon; and, much to the relief of the market, which has been hampered by the many restrictions as to dealings, no more is heard as to fixing maximum prices for these products. The recent introduction of a system of licences has brought about a lessening of the demand. Naphthalene, refined, is

MILES PLATTING,
MANCHESTER.

SAWER
and
PURVES.
(BRANCH OF METERS, LTD.

PREPAYMENT
METERS.

RADFORD ROAD,
NOTTINGHAM.

AGENT FOR SCOTLAND
JNO. D. GIBSON,
2, Causeyside St.,
PAISLEY.

suffering from the effects of the shipping situation, which renders export trade difficult; but the price remains at £30 per ton. The crude continues to vary from £7 to £15 per ton according to quality; the demand for lower grade being still keen, despite the fact that the firelighter industry can no longer be making heavy purchases. Aniline oil is dull and unchanged; and anthracene is lower again at 3d. per unit per cwt. Benzol, toluol, creosote, and carbolic acid remain under control, and go into consumption almost as fast as produced. The range of quotations is as follows:

Aniline Oil (pure): 1s. 4d. per lb.

Benzol: 90% London, 1s. 0½d., North 10½d. to 11½d.; 50% North 1s. 4d. to 1s. 5d. naked per gallon.

Carbolic Acid: 60% East and West Coast 3s. 6d. per gallon; crystals 40% 1s. 3d. per lb.

Crude Tar: London 32s. 6d. to 35s. Midlands 27s. to 29s.; North 28s. to 30s. per ton, *ex* works.

Pitch: London 48s. to 50s. f.o.b.; East Coast, 26s. to 28s. f.o.b.; West Coast—Liverpool 22s.; Manchester 24s. f.a.s.; Clyde 27s.

Solvent Naphtha: Naked London 90-190% 3s. to 3s. 3d.; North 2s. 9d. to 3s. per gallon; 90-160% naked London 4s. 3d. to 4s. 6d.; North 4s. to 4s. 3d. per gallon.

Crude Naphtha: Naked 30% 8½d. to 8¾d.; North 6½d. to 6¾d.

Naphthalene: Refined £30 to £32 10s.; salts 80s., bags included.

Toluol: Naked, London 2s. 4d.; North 2s. 3d.

Creosote: Nominal, London 4½d.; North 4d. to 4¼d. (Government price, 75s. per ton f.o.b.—equal to 4½d. per gallon); heavy oil, 4½d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4¾d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: 95%, 3s. per gallon; 97-99%, 3s. 3d. to 3s. 6d. per gallon, casks included, *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

There is practically no change in conditions, and considerable difficulty is being experienced in obtaining deliveries to be of any service for the current season's use. It has to be borne in mind that the demand for munitions purposes is continually increasing, and that the agricultural demand for the current season has been greater than ever before. On the other hand, outputs have not increased to a corresponding extent; and this in spite of the stoppage of export business. Supplies are scarce, and are likely to remain so for some weeks longer. Every effort is being made to speed up the output by the erection of new plants and the extension of old ones; but the acquisition of material and labour problems present many difficulties.

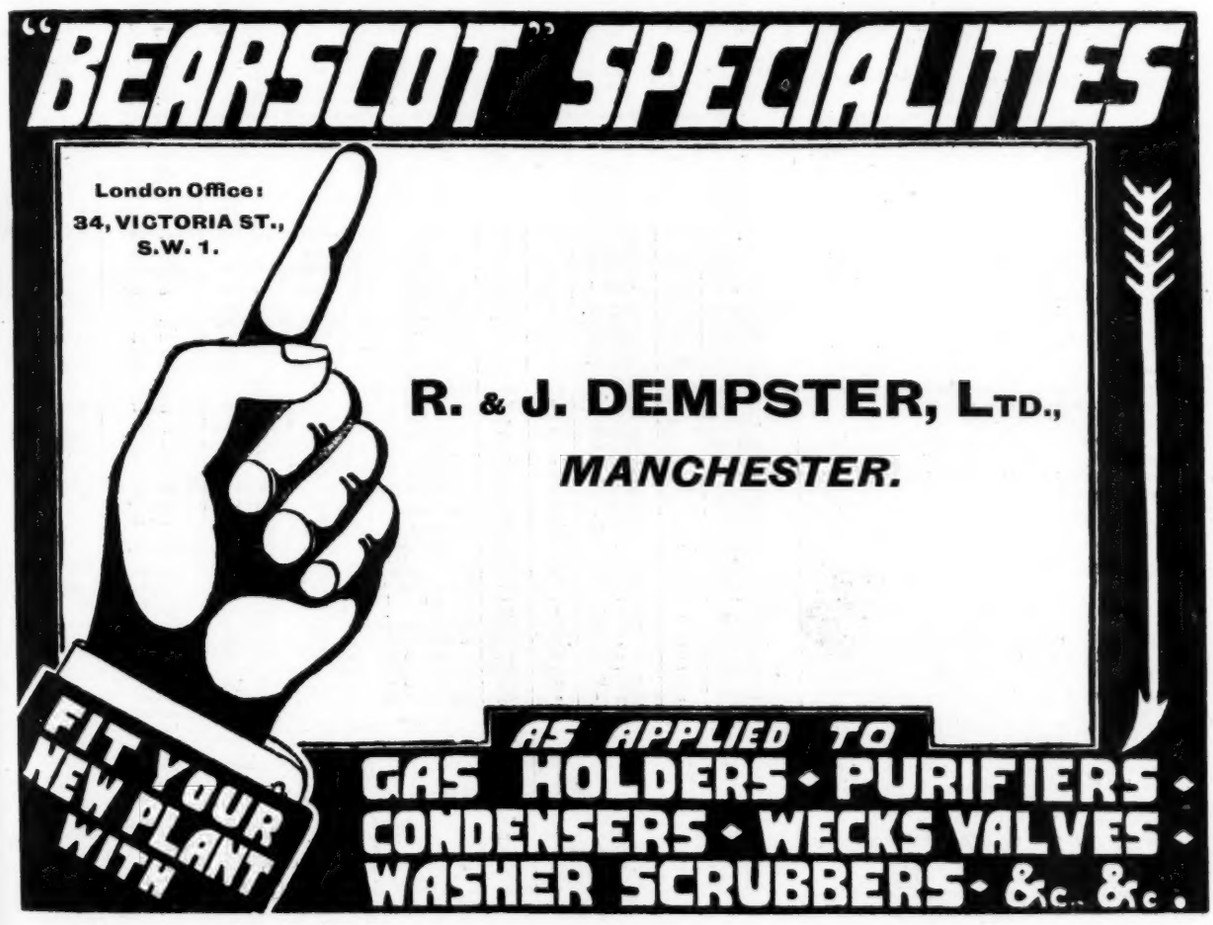
Messrs. A. & W. Richards, of No. 37, Walbrook, E.C., invite on behalf of the Directors, tenders for an issue of 450 £10 "B" shares and £1500 of 5 p.c. perpetual debenture stock in the Grays and Tilbury Gas Company. The shares rank for a standard dividend of 7 p.c., like the existing "B" shares, now receiving £5 5s. p.c.

Middlesbrough Corporation Employees' Threat.—Last Thursday it was announced that the Middlesbrough Corporation employees in all departments had decided to cease work on Friday of this week, unless a farm hand in the employ of the Corporation, who is alleged to have been dismissed because of his trade union principles, is re-instated.

Public Lighting of Edinburgh.—The Cleaning and Lighting Committee of the Edinburgh Corporation had before them on the 1st inst. the offer of the Gas Commissioners to supply gas for public lighting purposes during the ensuing year at 4s. per 1000 c.ft.; and on the motion of Councillor Stark (the Convener), a Sub-Committee was appointed to discuss the subject with a Sub-Committee of the Gas Commissioners.

Failure of a Coal-Tar Investigator.—Owing to the fact that he is in an internment camp, and has not yet filed his statement of affairs, the public examination of George E. Heyl, consulting chemical engineer, against whom a receiving order has been made, was, at the London Bankruptcy Court, adjourned until May 3. The debtor, in the course of his investigations of coal tar, found that by certain chemical methods products could be obtained which were commercially much more valuable than hitherto. He consequently equipped works at Barking, and spent £15,000 of his own money on plant and machinery. Subsequently, finding he required more capital, he made arrangements to form the business into a company; but the scheme was not carried out. He alleged his failure to have been caused through breach of contract on the part of the company promoter.

A Better Chance for Oil.—The "Petroleum Review" says: The hand of economy has been placed upon all citizens in connection with the use of electric current and gas, both for lighting and heating arrangements; while the regulations covering the ordering of coal render strict economy in this direction also inevitable. As a result, another opportunity has been given to oil to play an even greater part than it has done hitherto in furnishing light and heat to private residences. It is safe to say that for some long time past the use of illuminating oil has been on the increase, not merely in the country places which do not possess any up-to-date means of public lighting, but in the better-class homes of England, where oil is recognized as a light-giver of the first quality. Those who have given oil a serious trial admit that there is no question of its superiority; for its soft rays are far less trying to the eyesight than any other form of illuminant known. Then, again, the advance which has been made in the oil-lamp itself has materially tended to its increased use. The oil light of to-day is far before that evil-smelling lamp of the past; and it possesses a charm of comfort which is all its own. It comes as no surprise to us, therefore, to find that at the present time there is quite a shortage of oil-lamps on the market, due obviously to the demand which has sprung up for them on the part of new users. We are confident that in the future, oil as a lighting agent will be far more popular than in the past; the one regret is that some of the finest lamps are of enemy origin, and, of course, barred on patriotic grounds. But what a chance for the enterprising British manufacturer!



Tavistock Gas Company.—At the annual meeting of the Tavistock Lighting, Coal, and Coke Company, Ltd., the Chairman (Mr. T. Doidge) stated that the amount of gas made showed an increase of 5 p.ct. over the previous year, which was no doubt accounted for by a larger consumption for the purpose of cooking and heating. It was resolved that a final dividend be declared for the year at the rate of 3s. 4d. per share on the original capital, and 2s. 4d. per share on the additional capital, free of tax.

Fatal Accident at Tottenham.—At an inquest held at Enfield last Saturday week, on the body of William Doo, who met with his death while engaged at the Ponders' End works of the Tottenham District Light, Heat, and Power Company, the Jury returned a verdict of "Accidental death;" no one being in any way to blame for the occurrence. The deceased man was in the employ of Messrs. Parkinson and W. & B. Cowan, Ltd., and was occupied in cleaning out a station meter. He was working in the drum, with the aid of a gas-burner; and by some means the light (which had been fastened to the shaft) fell, and set fire to the accumulation of naphthalene, the deceased suffering from severe shock and burns. On behalf of the firm, it was stated that this was the first accident of the kind they had had. The Inspector of Factories expressed the hope that naked lights would not be used again for such work.

Dublin Gas Workers.—The Joint Committee of the Alliance and Dublin Consumers' Gas Company's employees decided last week, in view of the refusal of their demand for £1 a week wages increase on pre-war rates, to cease work on the 16th inst.; intimation to this effect to be given to the Company and the Ministry of Labour. There is a prospect of a settlement being arrived at by arbitration. In a new scale of building trade wages in Dublin, gas-fitters are given 46s. 6d. per week of 51 hours.

Auckland (N.Z.) Gas Company, Ltd.—It was reported at the 56th annual meeting of the Company that, for the year ended Dec. 31, receipts for gas showed an increase of £23,135—partly owing to an advance of price, but partly also to a gain of nearly 4 p.ct. in the quantity sold. On the other hand, there were large increases in expenditure; coal alone having cost £13,997 more. The profits, after deducting working expenses, cost of repairs and renewals, management expenses, interest, bad debts, and other charges, amounted to £56,002. Altogether there was a sum at the credit of profit and loss of £98,834, from which had to be deducted £27,384 distributed as interim dividend. The Directors recommended a dividend for the past half year of 11d. per share on the £1 fully-paid shares, and a proportionate one on the partly-paid shares. These would absorb £27,461, and leave £43,988 to be carried forward.

STOCK MARKET REPORT.

Business on the Stock Exchange last week was on a very reduced scale, as was only to be expected when all influencing factors are taken into consideration. To begin with, it had only a four-days' run, and this, too, following upon the long four-days' closure for Easter; so that markets scarcely had time to get fairly into swing. But, far and above all else, the gigantic struggle on the Western front was still raging with undiminished fury, and claimed the breathless attention of every patriotic Briton almost to the exclusion of all other thoughts and cares save such as might be imperatively incumbent. It is pleasing to note that the calm confidence in the Allied arms which marked the tone of the previous week was maintained and even accentuated. In no quarter was there pressure to sell, and such lines as evinced weakness were mostly under the sway of special and esoteric factors.

The gilt-edged market was again conspicuous, especially Home Government issues. War Loans were in brisk demand. The 5 p.ct. lead the way; and Consols and others also advanced. Home Rails had a favourable week, though the prior charges took some time to get into step with the rest. American and Canadian did not do so well. Argentines were aided by good traffics and forecasts of other improvements.

In the Foreign Market, a good point was the firmness of French. Japanese and Chinese were in request, and Spanish was firm; but Russians, not unnaturally, failed to shake off their depression. In the Miscellaneous Market there was not much to evoke interest. Rubber and Oil were quiet, and made no marked demonstration either way. Breweries were dull; but warlike material concerns were in favour.

Business in the Gas Market was again very quiet—much on a level with the state of things the week before. Only some half-score companies were dealt in, and the whole muster of transactions all together composed but a meagre array. The actual prices of bargains marked did not show much change from those last recorded; but a disposition towards easier figures was apparent from reductions in quotation, albeit slight in degree. Thus, British debenture, Gas Light preference, and Tottenham receded 1 each, European and Tynemouth ½ each, and Primitivas ¼ each. But Newcastle debenture rose 2½.

In the Money Market there was marked ease.

Bargains done for cash during the week were as follows: On Tuesday, British 31⅞, Gas Light ordinary 63¼, 64, 64½, Imperial Continental 85½, 86, Primitiva 34s., ditto preference 54s., Tottenham "B" 67½, 67¾, 68, Bridgend 10 p.ct. 5 3/32. On Wednesday, Cape Town 3⅜, European 7⅞, 7 15/16, Gas Light ordinary 63¾, Primitiva 35s. 0¾d., Cape Town 5 p.ct. debenture 60. On Thursday, Brentford "A" 76½, Cape Town 3 7/16, European 7⅞, Gas Light ordinary 63½, 64, ditto preference 68½, Primitiva preference 55s. 6d., South Metropolitan 64, 64¼. On Friday, Bournemouth "B" 10 1/16, 10⅛, British debenture 65, Gas Light ordinary 63⅞, 64⅛, ditto preference 69¼, ditto debenture 55½, 56, Primitiva 34s., 34s. 6d., ditto preference 52s. 6d., South Metropolitan 63⅞, 64, ditto debenture 54½.

The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	55—60	..
1,551,868	,,	April 8	2½	4⅛%	Alliance & Dublin Ord.	59—64	50—55*	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	53—63	..
280,000	5	April 29	7½	3/6	Bombay, Ltd.	5⅜—6⅜	5—5½	..
50,000	10	Feb. 26	16	13⅓%	Bournemouth Gas and Water — 10 p.c.	29—30	22—24	..
883,110	10	,,	7	7%	Bournemouth Gas and Water — B 7 p.c.	15—15½	10½—10⅝	10 1/16—10⅝
115,000	10	,,	6	6/-	Bournemouth Gas and Water — Pref. 6 p.c.	13½—14	9—9½	..
159,740	—	—	—	4%	Bournemouth Gas and Water — 4 p.c. Deb.	..	67—69	..
992,045	Stk.	Feb. 26	14	14%	Brentford A Consolid.	261—266	76—79	76½
734,920	,,	,,	11	11%	Do. B New	204—209	73—76	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	79—84	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	63—65	..
217,380	,,	Feb. 26	11	9%	Brighton & Hove Orig.	208—213	140—145	..
244,200	,,	,,	8	6%	Do. A Ord. Stk.	154—159	95—100	..
530,000	20	Mar. 26	12½	22/6	British	44—45	31—32*	31⅞
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	65—67	65
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	51—54	..
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½—2½	3/4—3/4	3 3/16—3 7/16
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	7—8	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	58—63	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79—81	..
1,518,280	,,	Feb. 12	5/9/4	41/4	Commercial 4 p.c. Stk.	106—108	67—69	..
560,000	,,	,,	5½	36/8	Do. 3½ p.c. do.	103—105	62—64	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	53—54	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	38—40	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	60—62	..
278,400	—	—	—	11½%	Croydon B and C 7 p.c.	..	155—165	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5⅔%	Derby Con. Stk.	123—125	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,092,180	10	July 29	10	6/8	European, Ltd.	17½—18	7½—8½	7½—7 15/16
16,298,975	Stk.	Feb. 10	4/17/4	37/4	Gas Light and Coke — 4 p.c. Ord.	98—102	63—65	63½—64⅝
2,500,000	,,	,,	3½	3⅜%	Gas Light and Coke — 3½ p.c. max.	76—79	55—57	..
4,062,235	,,	,,	4	4%	Gas Light and Coke — 4 p.c. Con. Pref.	96—99	68—70	68⅜—69½
4,674,850	,,	June 11	3	3%	Gas Light and Coke — 3 p.c. Con. Deb.	72½—74½	55—57	55½—56
130,000	,,	,,	10	10%	Gas Light and Coke — 10 p.c. Bonds	..	..	..
258,740	,,	Mar. 12	5	3½%	Hastings & St. L. 3½ p.c.	87—89	46—51	..
70,000	10	April 29	11	8%	Hongkong & China, Ltd.	16½—16⅝	7⅜—8⅛	..
86,600	—	—	—	9½%	Hornsey 7 p.c.	..	115—125	..
131,000	Stk.	Mar. 12	7½	7%	Ilford A and C	151—154	90—95	..
65,780	,,	,,	6⅜	5½%	Do. B	115—118	70—75	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	93—94	63—66	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	85—87	85½—86
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	82—87	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. A / B	211—213 / 146—148	82—84	..
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	71—73	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	3⅜—3¼	..
250,000	100	April 1	4½	4½%	Met. of Melbourne — 4½ p.c. Deb.	99—101	88—90*	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8—8½	..
1,875,892	Stk.	July 29	4½	3 15/16%	Newcastle&Gatsh'd Con.	96½—99½	73—74	..
632,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	63—64	..
55,940	10	Feb. 26	7/14/0	7%	North Middlesex 7 p.c.	14—15	9½—10½	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	103—105	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅞	2—3	..
60,000	50	Feb. 26	13	10%	Portsea, Island B	128—131	82—87	..
100,000	50	,,	12	9%	Do. C	118—121	72—77	..
52,000	50	,,	10	7%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1 15/16—1 7/8	34/— 35/9
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4½—5	2 5/16—2 7/16	52/6—55/6
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	76—78	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	57—62	..
150,000	10	May 14	6	6/-	San Paulo — 6 p.c. Pref.	10½—11	7 3/16—7 5/16*	..
125,000	50	July 1	5	5%	San Paulo — 5 p.c. Deb.	47—49	40—42	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	228—234	171—177	..
309,984	,,	,,	10	10%	Do. B	229—234		..
523,500	,,	,,	10	10%	Do. C	220—223		..
90,000	10	May 28	9	6/-	South African.	10½—11½	9—10	..
6,609,895	Stk.	Feb. 10	5/4/0	40/-	South Met. 4 p.c. Ord.	111—113	63—65	63½—64½
—	—	—	—	—	Do. Pref.	..	93—95	..
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	73½—74½	54—56	54½
224,820	,,	Feb. 26	8½	6%	South Shields Con. Stk.	157—159	134—136	..
952,795	,,	,,	6	4½%	S'th Suburb'n Ord. 5 p.c.	114—116	78—75	..
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	73—75	..
135,000	—	—	—	4½%	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	84—86	..
647,740	,,	May 14	5	5%	Southampton Ord.	99—102	75—77	..
120,000	,,	Feb. 12	7½	5½%	Tottenham — A 5 p.c.	135—138	90—95	..
782,275	,,	,,	6	4%	Tottenham District — B 3½ p.c.	115—117	67—69	67½—68
181,255	,,	June 26	4	4%	Tottenham District — 4 p.c. Deb.	87—89	61—63	..
189,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	103½—109½	87—88	..
30,000	,,	Feb. 26	8½	67/6	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	108—113	..
255,636	,,	,,	6½	52/6	Do. B 3½ p.c.	129—134	90—95	..
108,075	,,	,,	5/17/3	47/3	Do. C 3½ p.c.	110—115	80—85	..
353,000	,,	,,	6½	46/3	Wimbledon 5 p.c.	117—122	80—85	..
98,000	,,	,,	6½	52/6	Epsom 5 p.c.	121—126	80—85	..
88,416	..	June 26	3	3%	3 p.c. Deb. Stk.	66—69	49—52	..

*Ex Div.

The statement is made in the "Daily Express" that gas companies in certain London suburban districts in which there are large Belgian colonies are issuing instructions for reading meters in Walloon, Flemish, and French.

An increase of 3d. per 1000 c.ft. in the price of gas has been made at Monifieth, bringing the rate up to 5s. 8d. The rise is occasioned by the enhanced prices for coals and materials and increases in the wages to employees.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ENGINEER. Sheffield Gas Company. Applications by April 18.
SUPERINTENDENT. Liverpool Gas Company. Applications by April 23.
ASSISTANT MANAGER. Stretford Gas Company.
ASSISTANT CHEMIST (Tar-Works). No. 6436.
MANAGER (Gas Meter Works). No. 6437.
CHEMIST (Coke-Oven). No. A 5010, nearest Employment Exchange.
CARBONIZING FOREMAN. Blackpool Gas Department.

Appointments, &c., Vacant (*Continued*).

SHIFT FOREMEN (Two). Winchester Water and Gas Company.
FITTER AND TURNER. Hornsey Gas-Works.
RETORT SETTERS AND BRICKLAYERS. Portsea Island Gas Company.
BRICKLAYERS. Sheffield Gas Company.

Appointments, &c., Wanted.

COKE OVEN MANAGER. No. 6433.

Plant, &c., for Sale.

DRY METERS. Brighton and Hove Gas Company.
ROTARY BRUSH SCRUBBER. Halifax Gas-Works.
SATURATOR. Yorkshire Semet Solvay Company, Sheffield.

Plant, &c., Wanted.

GAS METER (30,000 c.ft. per hour capacity). No 6438.
PURIFIERS. Wick and Pulteneytown Gas Light Company.
STEEL MAIN (24 in.). Redditch Gas-Works.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

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Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

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Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

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O'NEILL'S OXIDE
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GAS PURIFICATION & CHEMICAL CO., LD.,
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"VOLCANIC" FIRE CEMENT.
Resists 4,500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 19, p. 371.

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ENGLISH BOG ORE AND NATURAL HYDRATED OXIDE OF IRON.
SPENT OXIDE BOUGHT.

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70, Chancery Lane, London.
Telegrams: "Patent London." 'Phone: 248 Holborn.
And 8, St. Nicholas Buildings, Newcastle-on-Tyne.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, London, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
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BAGLEY, MILLS, & Co., Ltd., 99, Victoria Street, Westminster, S.W., invite inquiries from all gas-works making 75 million cubic feet and upwards per annum.

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SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
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with which is amalgamated WM. PEARCE & SONS, LTD.
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In Bulk for Works Use.
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33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

THE WHOLESALE FITTINGS CO., LTD., 23-7, Commercial Street, London, E. 1, beg to Notify their Customers they have OPENED A BRANCH DEPOT at 14, NORTH STREET, STOKES CROFT, BRISTOL, for the Convenience of their West of England and South Wales Customers. Our Mr. H. THOMPSON, who is well known in the Trade, has charge of this Depot.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

COKE-OVEN Manager, now in Charge of large Installation, desires CHANGE. Experienced Waste Heat and Regenerative Ovens, Ammonia, Sulphuric Acid, Benzol Rectification, and Tar Distillation. Over Ten Years present Position. Ineligible for Army.
Address No. 6433, care of MR. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

LIVERPOOL GAS COMPANY.

APPLICATIONS are invited for the Position of SUPERINTENDENT of the Linacre Gas-Works. The Make of Gas per Day is about 18 Million Cubic Feet.
Candidates must be Ineligible for Military Service and have had considerable Practical Experience in Modern Methods of Carbonization, Carburetted Water-Gas Manufacture, the Control of Workmen, and the Care of Machinery and Plant on a fairly large scale. A Good Knowledge of Chemistry is also desirable.
Salary, £500 per Annum, with free use of Good House adjoining the Works.
Applications, stating Age, whether Married or Single, and full Particulars of Training and Experience, are to be addressed to the Chairman of the Company, and sent in not later than Tuesday, April 23, 1918.
RALPH E. GIBSON,
Engineer.
Duke Street,
Liverpool,
April 3, 1918.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every Description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, Rose Mount Ironworks, Elland.

STRETFORD GAS COMPANY.

ASSISTANT Manager Required. Apply, giving full Particulars as to Age, Education, Mechanical, and Technical Training, &c., Salary, and References, to H. Kendrick, Engineer and Manager, Gas-Works, Stretford, near Manchester.

WANTED — A Coke-Oven Chemist capable of Taking Charge of the Laboratory of a Large Bye-Product Coking Plant. No Person already on Government Work will be Engaged.
Apply, giving Particulars of Training, Experience, Age, and Salary required, to your nearest Employment Exchange, mentioning No. A 5010.

WANTED — Assistant Chemist for Tar Works Laboratory in Metropolitan Area.
Apply, by letter, to No. 6436, care of Mr. King, 11, Bolt Court, Fleet Street, E.C. 4.

SHEFFIELD GAS COMPANY.

GAS ENGINEER.

THE Directors of the above Company require the services of an Experienced ENGINEER.
Applicants must have a thorough knowledge of Carbonization, and also Purification and Distribution of Gas, must be able to Prepare Plans for and Construct New Works, and also understand the Distillation of Tar, the Making of Sulphuric Acid and Sulphate of Ammonia, and the Erection of Plant in connection therewith.
The successful Candidate will be required to Devote the Whole of his Time to the duties of the office.
Commencing Salary, £1000 per Annum.
Applications, marked "Engineer," stating Qualifications, Age, and whether Married or Single, to be Delivered not later than Thursday, April 18, 1918, addressed to Mr. Hanbury Thomas, Managing Director.
Testimonials not to be sent in the first instance nor until asked for.

By order,
WM. HAMBY,
Secretary.

Gas Offices,
Commercial Street. Sheffield,
March 28, 1918.

GAS-METER Works Manager required in an Old-Established Firm. Good Prospects for a Man thoroughly understanding the Trade.
Apply, by letter, stating Age and Qualifications, to No. 6437, care of Mr. King, 11, Bolt Court, Fleet Street, E.C. 4.

COUNTY BOROUGH OF BLACKPOOL.
(Gas Department.)

WANTED—An experienced Carbonizing FOREMAN.
Apply, stating Age, Wage, and Qualifications, to
William Chew,
Engineer and Manager.

Gas Office,
Princess Street, Blackpool,
March 25, 1918.

WANTED, by the Winchester Water and Gas Company, for their Gas-Works, Two SHIFT FOREMEN (Ineligible) to Take Charge under Works Superintendent. Night and Day alternately.
Apply, giving full Particulars, to the General Manager, 19, Staple Garden.

PORTSEA ISLAND GAS LIGHT COMPANY, PORTSMOUTH.

WANTED, immediately, Three Experienced RETORT SETTERS and BRICKLAYERS. Good Wages.
Apply, J. D. Ashworth, Engineer and General Manager, Hilsea Gas-Works, Cosham, Hants.

FITTER and Turner required. Present Wage, with War Bonus, for a full week's work, £3 9s. 2d. Regular Work to a Reliable Man.
Apply, in writing, stating Training, Experience, Age, and whether Married or Single, to the Engineer and General Manager, Gas-Works, Hornsey, N. 8.

BRICKLAYERS Wanted—Men used to REPAIRING and RESETTING RETORTS. Wages, 1/2¾, with 12½ p. ct. and 1/- per day full time money.
Apply, by letter, stating Experience, to the Engineer, Gas Company, Sheffield.

PURIFIERS WANTED.

WANTED, by the Wick and Pulteneytown Gas Light Company, Two PURIFIERS, 10 feet square or thereby, complete with or without Four Four-Way VALVES. Must be in Good Order.
Offers, stating Price, to be sent to Wm. McGiffin, Manager.

A SECOND-HAND Gas-Meter Wanted, 30,000 Cubic Feet per Hour Capacity.
Reply, stating Age, Maker's Name, and Price, to No. 6438, care of Mr. King, 11, Bolt Court, Fleet Street, E.C. 4.

STEEL MAIN.—About 130 Feet of 24 in. Wanted.
Price and Particulars to Albert E. Layton, Engineer, Gas-Works, Redditch.

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3-LIGHT DRY GAS-METERS.

THE Company have a Number of 3-LIGHT DRY METERS FOR DISPOSAL, many of which are in a Condition for Refixing after Examination.
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Gas-Works,
Halifax,
April 4, 1918.

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MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at THE MART, TOKENHOUSE YARD, E.C.
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